Global Impact Events are the cause for Plate Tectonics & the formation of Continents and Oceans

by Harry K. Hahn

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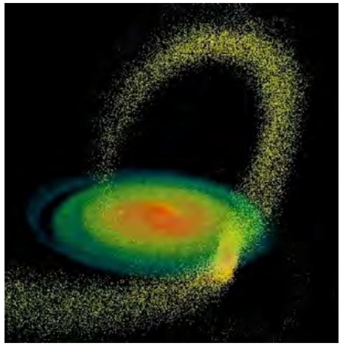
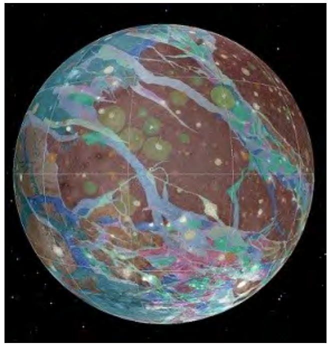
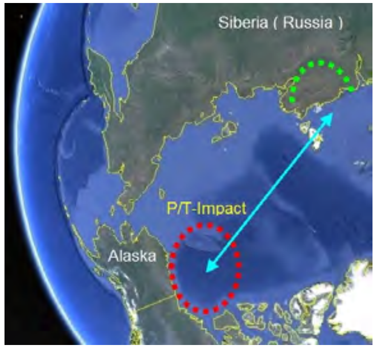
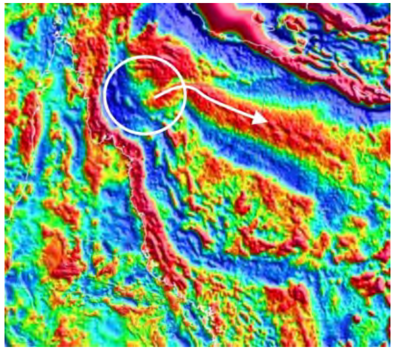
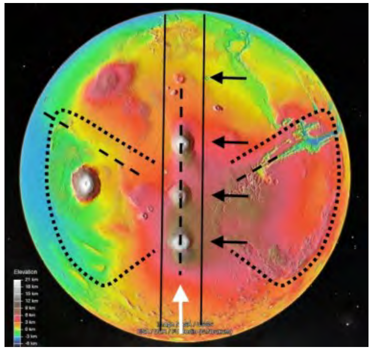










Hundred years ago the German Geoscientist Alfred Wegener published his book : **“The Origin of Continents and Oceans”**

In October 2015 a big meeting, a science conference, took place in Berlin, with the titel : “Dynamic Earth - from Alfred Wegener to today and beyond” This meeting reviewed the entire geoscience spectrum.

Unfortunately geosciences are currently based on a world model which is incorrect ! The assumption that mantle plumes are the primary cause of Plate Tectonics and Super-Continent break-up’s is incorrect ! Plate Tectonics on our planet Earth, during the last ~250 million years, is a direct result of a global impact event which took place at (and defined) the Permian-Triassic Boundary !

A number of scientists specialized in impact research already suppose that the Siberian Traps, the largest eruption of continental flood lavas on Earth, may be better explained by a large Impact Event than by a conventional mantle plume. To support geological evidence, the impact crater formed by such an impact event must have an estimated diameter of ~ 1000 km ! With my study I will provide the structural evidence that the impact researcher’s thoughts are correct, and that the Permian-Triassic Impact is a fact !! This new hypothesis about the location & the geological effects of the Permian-Triassic Impact will open a new chapter in Geology !

This diagram describes our fate ! (→ graph No. 5)

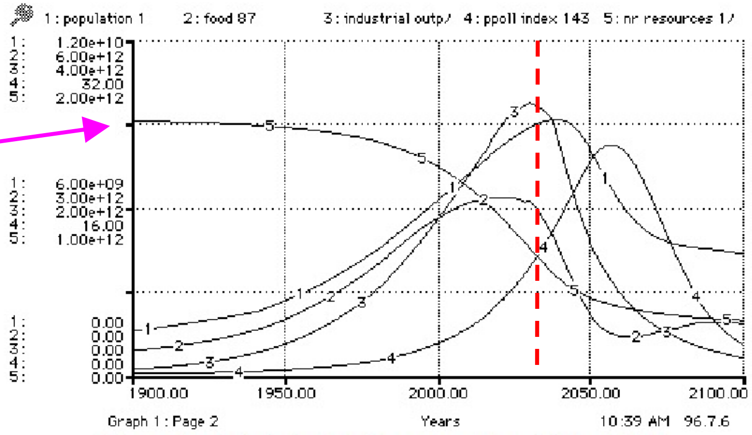
We are running out of resources with increasing speed !

Here are three short web-movies which explain you the serious consequences of exponential growth :

1.) Limits to Growth_Is the prediction going to happen ? **please also see → Part 2 !!**

2.) 7 Billion : How did we get so Big so Fast ?

3.) Exponential Growth



This diagram is the result of an extensive computer simulation of the whole world economy.

→ see World3 model

And it is clear that we need large amounts of resources in the next 30 to 50 years !

→ And the World-Economy may soon start to collapse if we can’t find enough resources for our Industries..

But to find the required resources

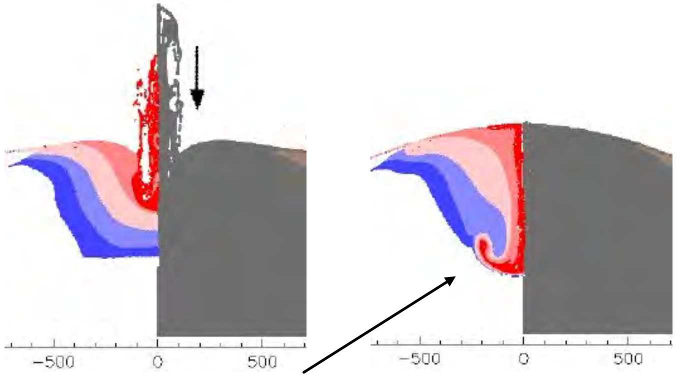
→ **A correct Tectonic Theory is needed !**

Some facts to understand the real cause of Earth's plate tectonic ! :

1.) **Not mantle plumes are the primary cause of plate tectonics !**

Global impact events caused by asteroid- or comet- impacts are the driver of plate tectonics !

→ The hard evidence will be the confirmation of the Permian-Triassic (PT) Impact Crater



This is a big mantle plume !! But it was caused by the impact of a 100km asteroid and didn't just develop out of the blue !
These images show a simulation of such an impact on the moon

Weblink: **"Numerical modelling of basin-scale impact crater formation"**
→ http://www.lpi.usra.edu/lpi/potter/publications/RossThesis.pdf
if weblink doesn' work: then type in shown web-address in the browser

2.) **The Geo-Scientists don't know yet that the Permian-Triassic boundary was caused by a large asteroid impact !**

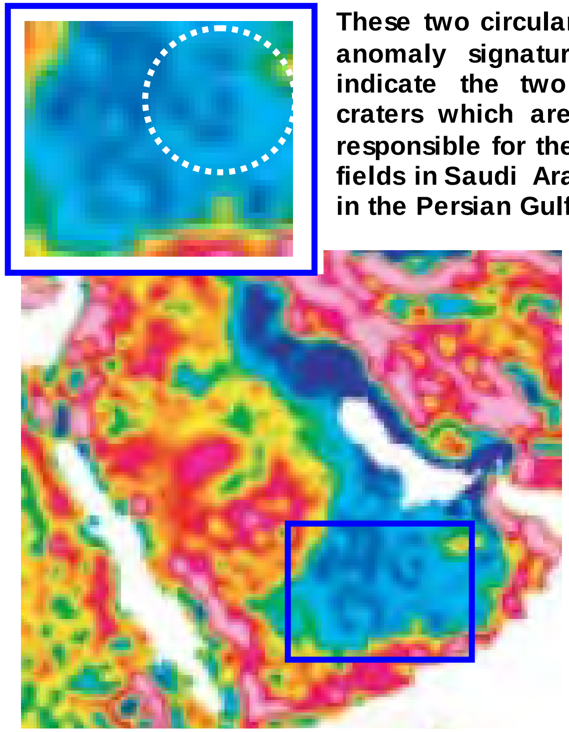
There are already some speculations around which assume that a large Impact Crater may have caused the P/T-boundary. But nowone has found it yet !

Yes there is a large Impact crater which has caused the P/T-boundary !!!

And it is so large, that probably everyone has just overlooked it because of its immense size !!

You need to move high above the Earth to see it !

In my study I will give a detailed description of the P/T-Impact Crater !



These two circular gravity anomaly signatures may indicate the two impact craters which are mainly responsible for the big oil-fields in Saudi Arabia and in the Persian Gulf.

(Eigen-GL04C free-air gravity anomaly map)

3.) **The distribution of metal ores or energy resources, like crude oil or natural gas, is not just a coincidence !! And many mining companies surely know that !!**

The distribution of many natural resources (e.g. metal ores & energy resources) is mainly caused by impact events !

That's why a precise knowledge of all impact structures on Earth is crucial !!

And the knowledge of the P/T - Impact Event and other large Impact Events will make a big difference at future explorations, in order to find all resources which are needed for the further peaceful & prosperous development of mankind !!

Geological evidence for the Permian-Triassic (P/T)-Impact Crater :

The hard evidence for the correctness of the statement, that “**Global** Impact Events* are the primary cause for Plate- (Expansion-) Tectonics and the cause for the formation of continents and oceans on Earth”, will be the confirmation of the Permian-Triassic (PT) Impact Crater (-Event) !!

A number of scientists specialized in impact research already proposed, that the Siberian Traps, the largest eruption of continental flood lavas on Earth, may be better explained by a large Impact than by a conventional mantle plume.

In the following I want to show now some extracts from a book written by the well-known impact researcher Prof. Dr. Christian Koeberl.
These extracts will provide further indication and evidence for the Permian-Triassic (PT) Impact Crater described in my study !

The titel of the book : **“Impact Markers in the Stratigraphic Record” – Authors : C. Koeberl & F. Martinez-Ruiz** (ISBN : 3-540-00630-3)

In the following the extracts from the book :

Page 29 : Siderophile element anomalies (e.g. enhanced Ir contents) were found at some P-Tr boundary locations (e.g., Holser et al. 1989). And recent research suceeded in demonstrating the P-Tr boundary event was a much shorter event than thought. At Meishan, China, a negative excursion in the carbon isotopic composition had a duration of less than about 160,000 years and suggested that it could be the result of the impact of an icy carbon-rich comet.

Page 29 : Kaiho et al. (2001) reported sulfur isotope and chemical data for samples from the Meishan (China) Permian-Triassic (P-Tr) boundary section. They interpreted S-isotope data, as well as the occurrence of Fe- and Ni-rich particles, as evidence for a large-scale impact event that penetrated the Earth’s mantle and formed a crater approximately **1000 km** in diameter.
A number of scientists pointed out that the Sibirian Traps cannot be the result of a mantle plume (e.g. Czamanske et al. 1998, Sharma 1997, Elkins-Tanton and Hager 2000)

Page 109 : An impact event is also supported by evidence from extraterrestrial noble gases in fullerenes recovered from P-Tr boundary beds in China, Japan and Hungary.

Page 109 : Because there is a similar duality of signals between likely volcanic and impact sources at the P-Tr boundary, similar to the K-T boundary, the hypothesis of Impact Researchers should be tested, which claims that the Siberian Traps could have been caused by decompression melting at the impact site. And that impact volcanism can uniquely explain the dual signals in the geological record.

Page 110 : An indicative model of Impact Researchers shows that it is possible for the volume of decompressed mantle beneath a large ~ 200 km sized crater to greatly exceed the excavated volume of the impact crater itself, primarily due to reduction of lithostatic load. Under suitable conditions of geothermal gradient, this would lead to near instantaneous melting with volumes of the order of 10^6 km^3 , similar to the characteristic volumes of LIP’s.

Page 110 : And the induced large-scale vertical and horizontal thermal gradients are expected to have a long-term effect on secondary mantle flow.

Page 111 : Decompression melting may contribute more melt than conventional shock melting.

Page 111 : We propose that the Siberian Traps, which are accessible and currently under considerable scrutiny, may be better explained by a large impact than by a conventional mantle plume. The closure of a former ocean between Siberia and Mongolia, as well as amalgamation with north and south China blocks may also have been occuring during Permian-Triassic times (→ and may be the result of a large impact event ! → comment from H.K.Hahn)

Page 97 : Decompression melting must be seriously considered whenever an impact is sufficiently large to cause the transient crater depth to excavate a substantial fraction of the local crustal thickness, and thereby cause a sudden drop in lithostatic pressure beneath the crater.

- Preface -

Before I start with the interesting part of my study, a few important words in advance :

I have already made an important statement on the front page of my study. → Geo-Sciences are currently based on a world model which is incorrect !! Not mantle plumes, are the primary cause of Plate Tectonics and the break-up of Super-Continents !!

→ **Global Impact Events** are the primary cause of Plate Tectonics, and the cause for the break-up of Super-Continents like Pangea (or more precise : the cause for the break-up of a planet's crust) !! → And Global Impact Events are also the reason for the development of oceans !

In principle oceans are caused by volatiles which escape from a planet's or moon's mantle, which is mainly caused by a large-scale decompression of the mantle, resulting from the immense fracturing of the planet's crust, caused by a global impact event.

Further I want to mention that there are business-interests and also geo-strategical reasons of course, that mining companies and maybe some scientific institutions too, seem to keep certain scientific knowledge about impact events on our planet Earth for themselves ! But that's no wonder ! Asteroids are loaded with gigantic treasures when they impact on Earth ! Beside Iron, Nickel and Cobalt they can contain considerable amounts of Platinum-Group-Elements (e.g. Platinum, Iridium, Palladium, Osmium etc.) and gold, and many other valuable resources. That's why having precise knowledge about a large-scale impact structure is equivalent to having a treasure map to a billion dollar treasure !!

I am sure that the "yet unknown" big impact-events described in my study will lead to resource-deposits with a total value > US$ 100 trillion !!

And it is easy to understand why mining companies and government institutions would never publish such a study !! Important impact-related discoveries in mining countries seem to be kept secret, in order to protect business interests and / or geo-strategical interests etc. !

That's why an ordinary person like me had to publish this study ! I am not interested in geo-strategical superiority thinking or in billion dollar mining business. My interests are a bit more far-sighted ! They are focussed on the survival capability of the entire mankind, in regards to resources (security) and in regards to active protection of our planet Earth against global impact events !! How much worth is all the smart geo-strategical thinking and the billion dollar mining industry when a 100 km asteroids comes along with 50 km/s and is impacting on Earth in two years time ??
The answer is : It's worth nothing, not one cent !!! It's loosing all it's value, latest in the moment the asteroid is impacting on our planet Earth !!!

And exactly this may happen, because we (an intelligent species !!) are absolutely not prepared for such a situation, and therefore we may go extinct in the same way as the primitive dinosaurs !! The dinosaurs have the excuse that they just haven't had the brainpower and the technology to do anything against an approaching asteroid !! But we don't have this excuse ! We have the brainpower and the technology to even deflect a Ø 200 km asteroid away from Earth ! But as mentioned before, we are not prepared, because of business-interests and geo-strategical reasons of companies & institutions which seem to hold back important scientific discoveries from the global economy & scientific (geological) society !

Unfortunately the danger for a global impact event is much higher than anyone has calculated it !! This is the clear result of my study !! Probably at least a dozen moons & planets of our solar-system experienced global impact events during the last 300 Ma, which fractured and completely destroyed > 50 % of their entire surface areas !! On Earth the PT-Impact Event killed > 70 % of all species !! Please keep this in mind !

As a worst case scenario we must consider a large accumulation (cloud) of asteroids & comets on a collision course with Earth, which is coming from deep space, with less pre-warning time (probably < 3 years), which may contain many asteroids & comets in the 0.1 to 100+ km diameter range, which we partly must deflect away from our planet Earth, because they are on a collision course !! But how can we, as a separated and constantly in (geo-strategical) wars entangled species survive such a scenario ? → Find a way forward, and the continuation of this text, in the **Epilogue** at the end of this study !!

→ But now to the interesting part of my study !! Satellite Images, maps & diagrams will do the job to understand the real cause of Earth's tectonic !!

Many types of maps must be analysed simultanously to find the correct tectonic model for Earth !! →Also have a look at the Wikipedia Links marked in **blue** !!

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→ First (2011) discovered impact structure : **Warwick Crater** (1)

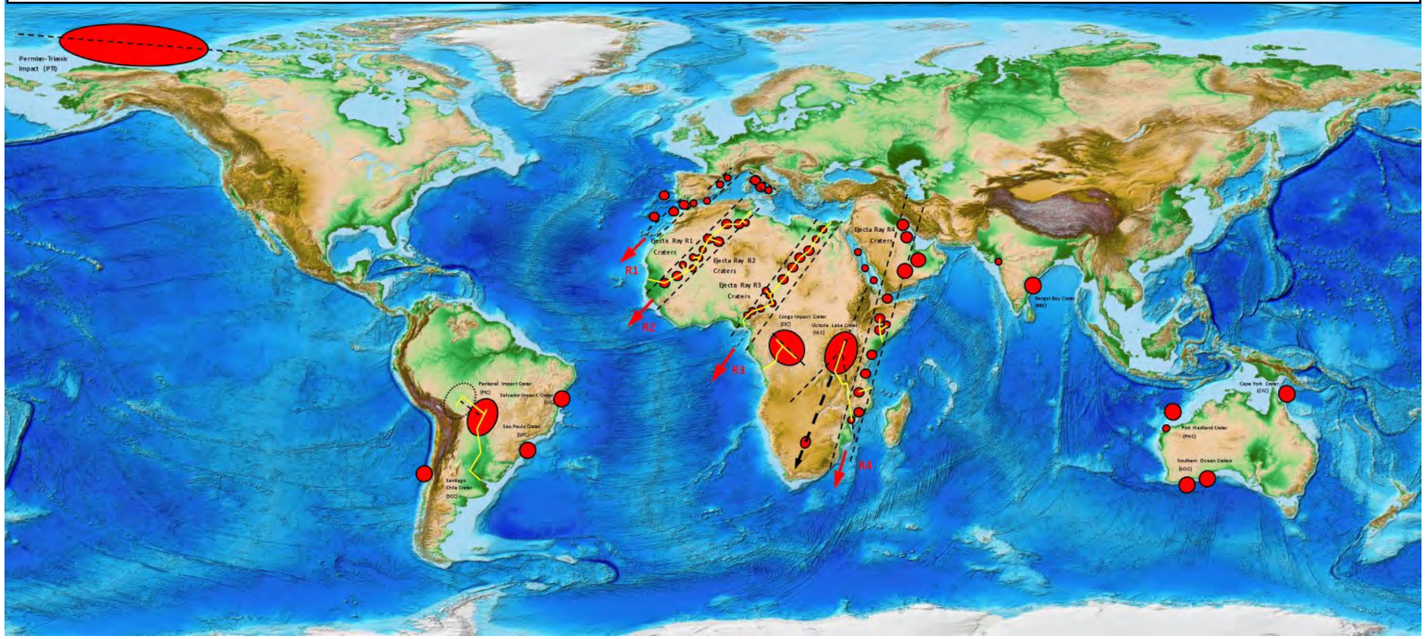
Executive Summary

Additional to my summary, which gives an overview of the Permian-Triassic Impact Event (PTI) and its causes & effects, I now want to add an executive summary with information about new discoveries, information about a first scientific evidence, which confirms a secondary crater of the PT-Impact Event, and an action plan, in particular to find & secure important energy resources (oil & gas) & minerals, for the growing world population..

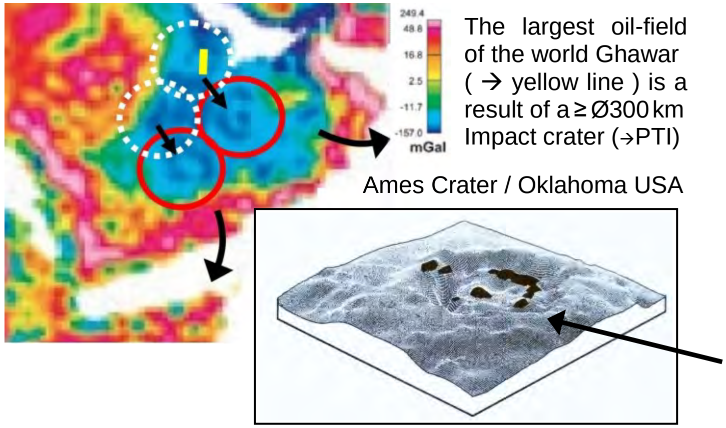
I consider crude-oil as the most critical energy resource over the next few decades (→ worldwide transport of goods & people depends to > 90 % on crude-oil !), see: Study1, Study2 That's why I want to start with a request directed to the G20 & UNO

An international oil-exploration program must be started to explore, analyse and assess the expected large oil-fields located in the crater areas described in my study, which are still unknown to the oil-exploration-industry ! The following map shows crater areas with potential for large oil fields

Topographic map showing the PTI-Crater and mainly secondary craters (& crater chains) caused by the PTI :


Permian-Triassic Impact (PTI)
Ejecta Ray R1 Craters
Ejecta Ray R2 Craters
Ejecta Ray R3 Craters
Ejecta Ray R4 Craters
R1
R2
R3
R4
Congo Impact Crater (CIC)
Victoria Lake Crater (VLC)
Bengal Bay Crater (BBC)
Cape York Crater (CYC)
Port Hedland Crater (PHC)
Southern Ocean Crater (SOC)
Pantanal Impact Crater (PIC)
Salvador Impact Crater (SIC)
Sao Paulo Crater (SPC)
Santiago Chile Crater (SCC)

Because there is a close link between impact craters and potential large oil-fields, as the **Ames Crater** (ø 14 km) in Oklahoma / USA clearly shows, it is only logical to carry out exploration drills in the new discovered impact crater areas too !



The largest oil-field of the world Ghawar (→ yellow line) is a result of a ≥ Ø300 km Impact crater (→PTI)

Ames Crater / Oklahoma USA

The largest oil-field in the world, the **Ghawar Oil-field** in Saudi Arabia, is a result of a ≥ Ø 300 km crater which was caused by the PT impact event ~250 Ma ago.. This is indicated by the circular structure (blue) visible on the gravity anomaly map of Arabia. (→ see map on the left).

After the impact event the upper layers of the two visible 300 km craters (red) slowly drifted away from the original impact sites (marked in white). The Ghawar Oil-field is located close to the center of the original impact site of the northern crater ! (→ Ghawar Oil-field marked by a yellow line).

A scientific analysis of the **Ames impact crater** in Oklahoma showed, that the impact not only produced the required structural traps (by impact induced fracturing and brecciation of the granite under the crater, which resulted in very effective porosity & permeability), but also the palaeo-environment for the deposition of post-impact shales that provided the oil & gas (**black**), upon subsequent burial and maturation. The Ames Impact crater, which has a central uplift, is buried under 3 km of Ordovician Oil Creek shale and more Recent sediments. Approximately 100 wells have been drilled at Ames with a success rate of 50%. The reserves at Ames will exceed 50 million barrels of oil and 15-20 billion cubic feet of gas.

Another example is the worldclass Cantarell Oil-field which is located near the ø 180 Chicxulub Crater in Mexico. The main hydrocarbon-bearing breccias of this oil-field resulted from the collapse of an offshore carbonate platform caused by seismic waves from the Chicxulub impact
The Canterall Oil-field has produced 7 billion barrels of oil and 3 trillion cubic feet of gas. The primary reserves may range as high as 30 billion barrels of oil and 15 trillion cubic feet of gas.

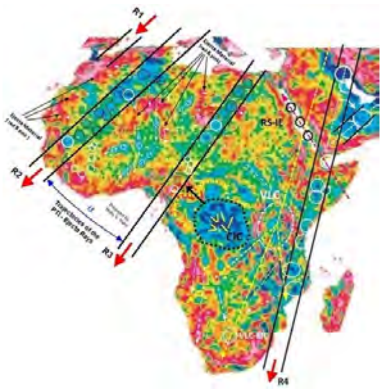
In North-America approximately 50% of the impact structures in hydrocarbon-bearing sedimentary basins have commercial oil- and/or gas-fields.

If we use the Ames Crater as a reference, then a ø 150 km crater, which covers an area which is around 115 times larger than the Ames Crater could easily contain 3 to 6 billion barrels of oil and 2 trillion cubic feet of gas ! (→ the reserves at Ames Crater multiplied by a factor of 115)

This corresponds roughly to the oil- & gas-reserves found near the ø 180 km Chicxulub crater so far !

Therefore we use the above calculated reserve-values as a first reference for a ø 150 km crater.

All the new impact craters discovered during this study should lead to new oil- & gas-fields with more than 600 billion barrels of oil-reserves, and with more than 300 trillion cubic feet of gas-reserves ! (→ at a ~50 % success rate)

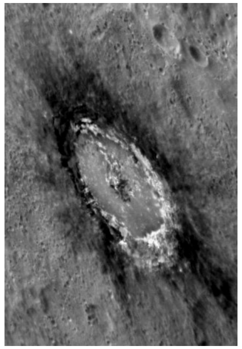


Especially the crater chains R1 to R4 and the CIC which are located on or near the African Continent, will contain a large share of these impact related oil- & gas-reserves. Because at least 50 ≥ ø150km craters are located within the crater-chains R1-4 & the CIC

The expected reserves in this areas alone should exceed 400 billion barrel oil & 200 trillion ft^3 of gas.

Additionally large reserves of metal-ores should be located in the ejecta areas of these impact craters.

I now want to mention an interesting discovery on Mercury. The image on the right shows the ø 80 km Basho Crater on Mercury. The low-reflectance material (black) which is surrounding the crater is a form of carbon called graphite.



The scientists believe it was excavated by the impact from the planet's original, ancient crust which lies deeper.

It is thought that Mercury was once covered by a crust composed of graphite, when much of the planet Mercury was still molten.

An alternative explanation would be that the carbon was brought-in by the impactor itself, for example if the impactor was a carbon-rich comet. This would be my first guess when I look at this image. However an origin from within Mercury (from Mercury's mantle) is also possible.

I mention this discovery for the following reasons :

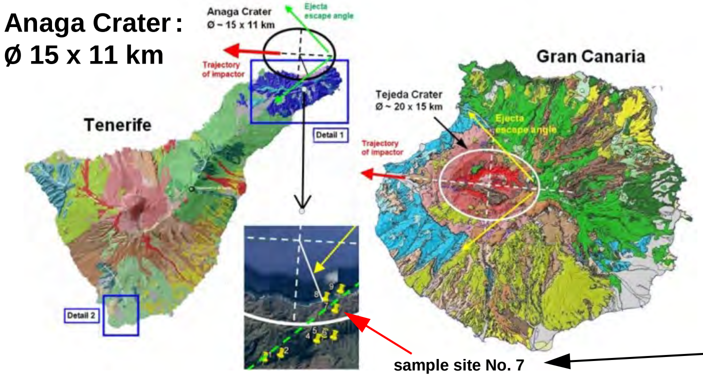
1.) In all probability the PT-impactor was a carbon-rich comet with a diameter of ≥ 50km.

2.) Lengai Volcano located in Tanzania within the strong ejecta ray R4 is erupting Carbonatite Lava, Carbonatites are formed essentially of carbonate. Because the distribution of carbonate rocks in Europe seems to be closely related to the impact event in Europe, caused by PTI-ejecta, it must be considered that the carbonate which formed the carbonatite lava originates from the PT-impact.

3.) The 12 km "Kola super-deep borehole" showed that at a depth > 7 km the rock in Earth's crust is saturated with Hydrogen (H_2) and H_2O which originates from deeper sources in the mantle ! Therefore we must take into consideration the possibility that certain amounts of the hydrocarbon reserves found close to impact structures could be a result of the thermochemical processes which are going on during & after the impact event !

(→ especially the gas reserves (CH_4, C_2H_6 etc.))

Anaga Crater : Ø 15 x 11 km



sample site No. 7

Scientific proof for a possible secondary crater:

The first diagram below is from the following study : "Infrared, Raman, and cathodoluminescence studies of impact glasses" from Arnold Gucsik, Prof. Koeberl & others. It shows Raman-Spectra of three types of known impact glass samples.

The Raman spectrum of the sample **No. 7** which I collected in the Anaga Range on Tenerife Island shows very similar spectra like two of the known impact (diaplectic) glass samples (see diagrams). This provides the **first scientific evidence** that the oblique impact crater Ø 15 x 11 km, which I assume on Tenerife (→ see image below) is a fact !

This impact crater, together with a nearly identical crater on Gran Canary (→ same orientation and similar size !) provides the first scientific proof for secondary craters, caused by the described global impact event at the Permian-Triassic boundary !!

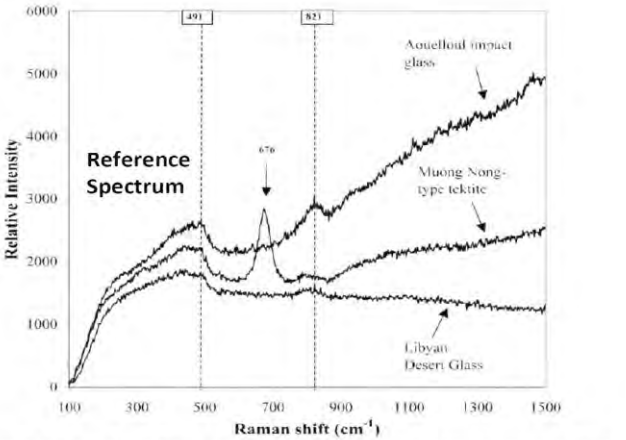
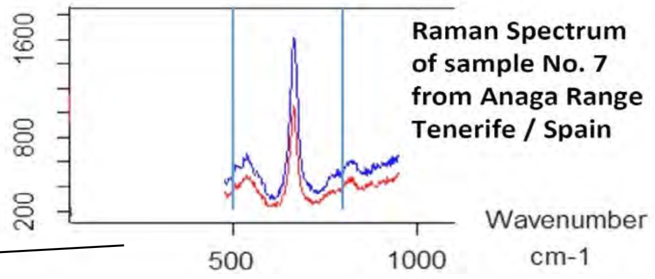
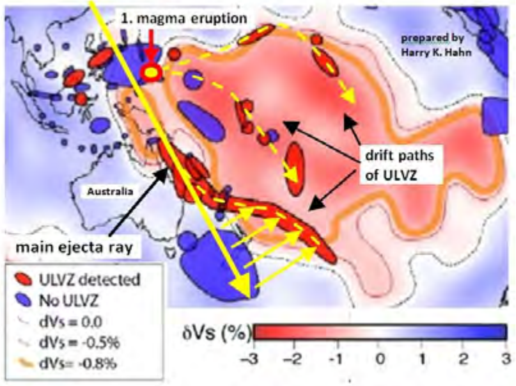


Fig. 8. Raman spectra of Aouelloul impact glass (a), Muong Nong-type tektite (b), and Libyan desert glass (c) generally exhibit two broad bands at 491 and 821 cm^{-1} and relatively high background fluorescence, which indicate a high degree of amorphization. These broad bands might be due to diaplectic glass. The numbers denote peak positions in cm^{-1}.



To the new discoveries :

An essential new discovery in comparison to the first edition of my study is the fact that the Pacific Plate and the expansion tectonics process which has formed it, is the result of ≥ 8 gigantic magma eruptions in the west pacific region over the last 200 Ma. These magma eruptions were caused by the Pacific-LLSVP-(ULVZ), which in all probability is a direct result of impacting ejecta of the PTI !



Further new discoveries are the Victoria Lake Impact event, the Canary Islands Impact event, the localization of the “Bay of Lyon” Crater, the correct position & orientation of the Indian Plate, Madagascar and South-America at the time of the PTI-event and some other new interdependencies. (See new pages, changes & additions in my study)

Regarding the described magma eruptions in the West Pacific the following **Warning** must be given :

With high probability another magma eruption will take place in the west pacific region ! In all probability it will occur in proximity to the Fiji Islands. When it will happen is difficult to say ! Therefore the mantle area below the Fiji region must be examined with seismic tomography in more detail, e.g. the vertical velocity of the magma flow under the Fiji region must be measured !
Note that a new mass extinction, caused by another gigantic magma eruption of the Pacific-LLSVP, can begin at any time ! Within a short time period such a largescale magma eruption could kill up to 60% of all species on Earth ! Like the other eruptions in the past it will cause an oceanic anoxic event (like the OAE-1a & OAE-2 etc.) which will release vast amounts of CO$_2$, H$_2$S etc. into the oceans and will kill up to 60% of all marine species. Largescale explosive volcanism with vast amounts of CO$_2$ released will be a result too (eg Ajupa Island)

It could begin in a few years, or it may not happen in the next million years. But in all probability it will happen sometime within the next ~5 million years ! A solid column at the top end of the Pacific LLSVP near Fiji, which is located close to the surface, may be an indication of the next due magma eruption !

And there seems to be a connection between these magma eruption events in the west pacific region and the 62 Ma bio-diversity cycle on Earth (→ Extinction-cycle with two half periods of 31 Ma)

→ See Introduction : “62 Myr Bio-Diversity Cycle”

In all probability some of these violent magma eruptions were triggered by extreme earthquakes, e.g. caused by impact events, like the Chicxulub-Impact in Mexico. Like a punch which triggers an eruption of the contents of a heated Coke-bottle, the shock waves of an extreme earthquake may finally trigger a magma eruption from the Pacific-LLSVP (→ caused by a sudden pressure spike) !

But to make it clear : We are looking at two different periodic cycles here !

The periodic magma eruptions of the Pacific-LLSVP are caused by thermochemical processes which are going on inside the LLSVP & ULVZ. There seem to be longterm thermochemical processes at work with cycle lengths of 10 - 30 Ma (million years). (→ the cycle length seems to decrease over time)
And the final stage of this cycle, the magma eruption, can be triggered by an outer shock event

The 62 Myr Bio-Diversity Cycle (or 62 Ma Extinction-cycle !) is caused by a precise periodic astronomical event going on for at least 500 Ma !

In all probability it is caused by the periodic crossing of the galactic plane by our solar system every 31 Ma. Every second crossing of the galactic plane seems to be particularly dangerous, because it has produced a worldwide mass extinction every time for the last 8 (62 Ma)-cycles !

6 of this 8 crossings caused a mass extinction each time, killing ≥ 70 % of all marine species on Earth ! Because our solar system moves along a spiral path around the galactic center, at every second crossing our solar system crosses the same ring area of the galactic plane, which in all probability is densely packed with debris resulting from collisions of our Galaxy with the Sagittarius Dwarf Galaxy (Sgr-DG).

→ The situation is comparable with a moon or space-craft which is crossing Saturn’s Ring. It will surely be hit by debris located within Saturn’s Ring !

See the following NASA article

And to point this out: Our solar-system is currently crossing the galactic plane in this obviously dangerous ring-area ! We know that the last world-wide extinction took place 65 Ma ago !
Therefore the next worldwide extinction event seems to be overdue and can happen at any time ! Maybe we just haven’t passed the debris-layer yet !

By the way : This assumed debris-ring (or debris accumulation) may be the cause of the Oort Cloud (→ the source area of comets !) around our solar system, and the densely packed debris ring(s) in the galactic plane (similar to Saturns ring) may offer an alternative to explain the Dark Matter problem !!

Looking at the other global impact events which I have discovered on the planets Venus, Mars & Pluto, and on the moons Ganymede & Charon, which all indicate orbit inclinations ≥ 40° for the original orbit of the impactors (comets or asteroids), then it certainly must be taken into consideration that the impactors came from outside our solar system !! → either from the Oort Cloud, or from the assumed debris ring (layer) in the galactic plane !

Because these global impact events probably all occurred within the last ~250 Ma, we must expect large impactors which are coming with high velocity from deep space !!

As long as we don't exactly know the physical process which has caused the global impact events within the last 300 million years, described in this study, we must take sufficient precautions !! Because we are not able to deflect such large impactors yet ! We just don't have the required defence capability and technology to do that !

Therefore an asteroid- & comet deflection system must be built which protects our planet!

I have made an own assessment, and I found a few suitable defence strategies which are able to cope with large impactors, up to Ø 200 km !!

How such a defence system for our planet Earth could look like is described in my following study :

See : → "To the deflection of asteroids in the diameter range of 5 to 200 Km"

It will probably take at least 20 years to design, build and install such a defence system and it would probably cost ≥ US$ 100 billion ! But it is our responsibility to build such a system !

It is also our task & responsibility to settle on our neighbour planet Mars as soon as possible, and to establish an independent civilisation on Mars, which doesn't need support from Earth to survive !

This is the only way to make sure that our advanced technological civilisation will survive in the case of a global impact event on Earth, caused by a large impactor coming from deep space, or in the case of another gigantic magma eruption caused by the Pacific LLSVP.

We may be able to build a defence system against a large impact on Earth. However it's not possible to build a defence system against a gigantic magma eruption coming from Earth's mantle !!

That's why the development of nuclear drives for spacecrafts must be accelerated. We need much more payload capacity ! Instead of just being able to lift 10 tons into orbit, we need payload capacities of thousands of tons to really make progress in establishing settlements on Mars and on other planets and moons. If we shift our focus to the development of nuclear driven spacecraft we can achieve this within a few decades !

Please note that 10 kg enriched Uranium contain as much energy as thousands of tons of rocket fuel !! We already have enough fuel (enriched uranium) to build hundreds of spaceships with payload capacities ≥ 1000 tons !! The weapons industry worldwide must be redirected to build such large spaceships, and the space-technology which we need for the colonization of Mars, instead of ever-increasing the weapons-piles on Earth !! We must shift our focus !!!

The G20 & UNO must now set a new framework, so that "resource wars" can't happen anymore !!

Therefore I suggest an **action plan** & a number of global regulations which have the following goals :

1.) To secure and explore the required **resources** for mankind far in advance before they are needed

2.) To define which resources should be extracted first and which ones should be put on hold, in order to minimize the environmental impact of the mining industry, in particular regarding very sensitive natural environments.

3.) Altogether there should be a longterm planning for a secure and environmental friendly resource exploitation worldwide.

Speculation on commodity markets must be restricted by setting bandwidths for trading. Commodity prices must be forced into defined bandwidths to provide stability for world's economy.

And a worldwide analysis of all available resources & reserves must be carried out under control of the UNO & G20. A precise projection of the resource needs for the next 30 years must be done, and a 30 Year plan for food-, water-, energy- and mineral resources supply for mankind must be set up. Because the next 30 years will be the most challenging time in human history, with maximum resource consumption !

4.) Mining industries which are critical for the resource supply for mankind should be under observation and protection of the UNO & UNSC. (for example the crude oil exploration industry)

5.) More food and energy reserves (oil & gas) must be kept in stock during the coming very low sun-spot-cycle minima, in which cold Winters and shortened harvest seasons must be expected !!

see following links : link_1 , link_2 , link_3 , link_4

6.) The population growth in the fastest growing countries must be reduced as quickly as possible with the financial help from the G20 & UNO.

And much more irrigated farmland is required !!

A Top-Down Approach required to reduce resource consumption worldwide ! First it must be defined how much resources can be used over the next 30 years. Then all key-industries must get limits for the use of resources, which they shouldn't exceed !

We need to refocus ! We must start many international projects where all members of the UNO & G20 work together to achieve a better and saver life for all people, a healthy environment and in general a good and positive vision for mankind !

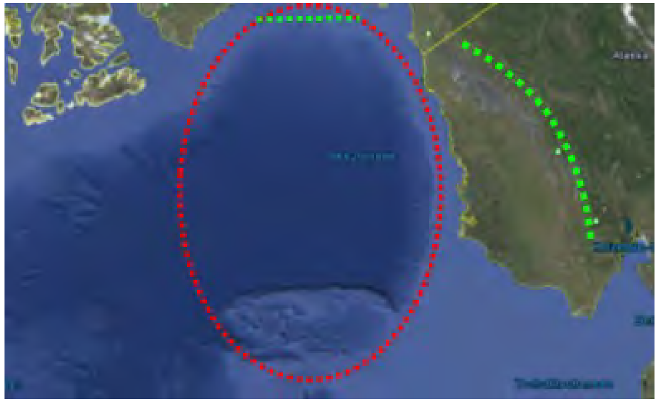
One of these positive visions must be a constant settlement of mankind on Mars, realized by the G20 and the UNO !

The author : 8.7.2017

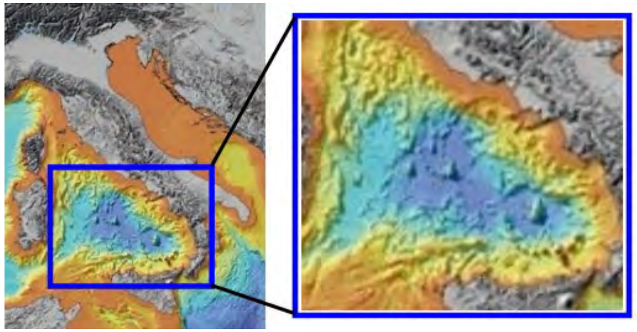
Harry K. Hahn

Summary

There is evidence for an elliptical impact crater with the enormous dimensions of **1330 x 880 km** in the Beaufort Sea near the north-coast of Alaska. This impact crater seems to be responsible for the Permian-Triassic boundary, which has caused the most severe mass extinction in Earth's history, ~253 million years ago. This Permian-Triassic (PT)-impact crater was formed by an oblique impact. That means that the impactor collided with our planet at a very shallow angle of probably less than 15°.



The impactor, an asteroid or a carbon-rich comet with a diameter of 60 to 150 km, impacted in the Beaufort Sea close to the northpole and caused a gigantic butter-fly shaped ejecta blanket with two large ejecta wings which covered the majority of the northern hemisphere. Within the boundaries of this ejecta blanket many large secondary impact craters were formed by the ejecta, with crater diameters of up to 450 km. In Europe (in the mediterranean area) at least 8, but probably up to 20 such large secondary craters were formed by the impacting ejecta, which was thrown out of the PT-impact crater. These impact craters and the resulting large-scale magma (lithospheric) flow is responsible for the tectonic development of Europe during the last ~253 Ma. Two of these secondary craters (∅160 & ∅220 km), which formed the Tyrrhenian Sea north of Sicily (Italy) and which are still noticeable on topographic- & geological maps (see below), should provide the evidence to confirm the described impact scenario

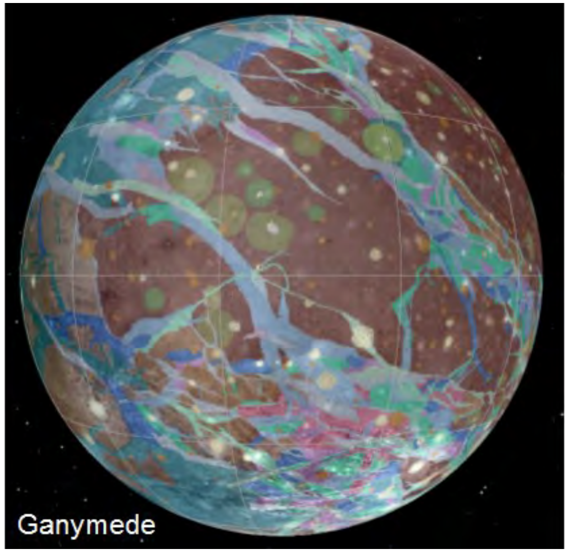


The main impulse of the PT-impact, together with the impulses and secondary craters, produced by the ejecta material, caused a global fracture pattern on Earth's crust, which was the trigger for the break-up of Pangea and a global expansion tectonic process. This expansion tectonic process caused the dichotomy on Earth → the formation of continents and ocean basins. And it is responsible for the transport of large amounts of volatiles from Earth's mantle to Earth's surface. Earth's diameter increased from an estimated diameter of 6500-7500 km ~253 million years ago to a diameter of 12756 km today, with an average expansion rate of ~ 20mm/year. The expansion of Earth was caused by abprupt decompression of Earth's mantle, which led to the large-scale expansion of volatiles, especially H_2O (water), in Earth's mantle. Through the abrupt decompression of Earth's mantle, caused by the extensive fracturing of Earth's crust, the solubility of H_2O and other volatiles in the mantle material decreased below the volatile concentration. That's why Earth's mantle became super-saturated with H_2O and other volatiles (e.g. CO_2 & SO_2), which then started to exsolve and form small gas-bubbles in the mantle material. These gas-bubbles continued to grow, and they were responsible for the transport of magma and volatiles (especially H_2O) to Earth's surface, through the overpressure which they caused in the mantle material. The ocean basins, which represent new surface area of our planet and which formed between the old crust fragments (the continents), continuously filled up with water (H_2O) over the last 253 Ma. This water was, and still is, transported from Earth's mantle to Earth's surface through the fractures caused by the PT-impact, and through the Mid-Ocean Ridges were the new surface areas of our planet Earth (→ the ocean floors) are continuously created.

In the same way as the water was transported to the surface of our planet Earth, and in the same way the expansion tectonic process was initiated on Earth it happened on other planets and moons of our Solar System. There is evidence for other powerfull global impact events which occurred on the planets Venus, Mars and Pluto, on Jupiter's moon Ganymede, on Saturn's moons Enceladus & Iapetus, on Pluto's moon Charon and on our moon These global impact events, which are described in more detail in this study, in all probability all took place within the last 300 million years !

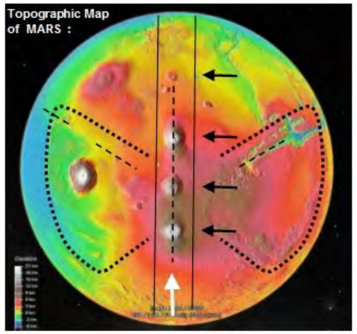
The best examples for global impact events, which triggered a global expansion tectonic process, can be found on Earth, Mars and on the Jupiter moon Ganymede. The most obvious global expansion tectonics is visible on Ganymede. The shape and position of the older crust fragments (brown color), and the clear evidence for a global impact event, which caused the global fracture pattern on Ganymede, only allows one logical conclusion ! :

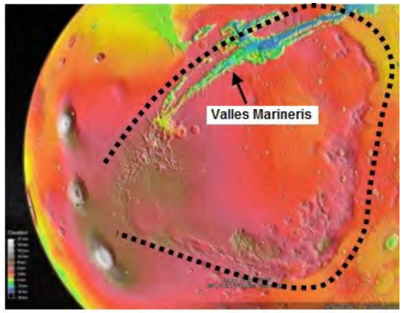
There is a global expansion tectonic process in full swing on Ganymede, which is driven by an expanding mantle (→ expanding volatiles) !



And the most obvious example of a global impact event, which caused a global fracture pattern, is certainly Mars ! The perfect linear arrangement (or chain) of the three nearly identical shield volcanos Arsia-, Pavonis-, and Ascraeus Mons, which are actually three ∅ 400 km impact craters with a later formed shield volcano on top, are a first strong indicator for a global impact event. The second indicator is the clear noticeable ejecta area located on the righthand side of the mentioned linear chain of large impact craters. And the third and most obvious evidence is the 2400 km long nearly perfect linear crack (fracture), which was caused by the strong impact impulse of the ejecta of the right ejecta wing, which was ejected by the mentioned three large impact craters.

This 2400 km long impact-related linear crack (fracture), which is better known under the name “Valles Marineris”, will provide another important proof ! “Valles Marineris” will provide the best proof in our solar system, that expansion tectonics is driven by abprupt decompression of the mantle, which causes large-scale expansion of volatiles in the mantle, especially H_2O. And it will provide proof that the water in the Oceans of Mars and Earth had its origin in the mantle of these planets !



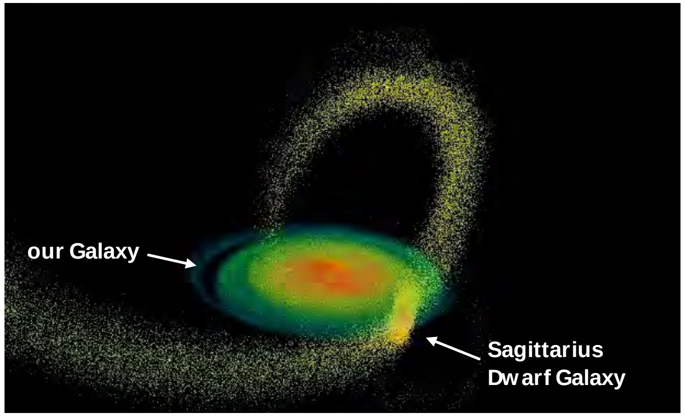


Global impact event on Mars, shown on Topographic Map

Now, what event could be responsible for a period of global impact events in our Solar System ? What astronomical event has sent all the large impactors onto a collision course with the above mentioned planets and moons ? It certainly was a very powerfull astronomical event !!

And indeed, there is indication that a powerfull astronomical event, which is going on, in and around our Galaxy, is responsible for these global impact events and the periods in which gigantic debris streams crossed our Galaxy and the spiral-arm in which our Solar System is located in !!

This event is the periodic collision of the Sagittarius Dwarf Galaxy (Sgr-DG) with our own Galaxy ! There were already at least two such collisions (pericenter events No.: 1 & 2) in the distant past, the first one at 1.9 Gyr (1.9 billion years) before present , and the second one at 0.9 Gyr (900 million years) before present. And the last (third) collision is still going on at the moment !



Under consideration of an orbit period of ~ 230 Ma for our solar system around the center of our galaxy, our Solar System came close several times to the mass stream (debris stream) resulting from the collision with the Sgr-DG. This occured at the following times : → in the time period 2 to 1.5 Gyr before present (1. pericenter event), in the time period 1.3 to 0.9 Gyr before present (2. pericenter event) and in the time period 0.6 to 0.1 Gyr before present (3. pericenter event).

Because these time periods are in good agreement with the U/Pb Zircon age peaks in orogenic granitoids (& detrital zircons) on Earth, which are related to the break-up & formation of super-continents, it is only logical to conclude that each pericenter event with the Sagittarius Dwarf Galaxy resulted in a super-continent “break-up” & “formation” cycle on Earth ! Or in other words : Each pericenter-event caused at least one global impact event, which means a completely shattered (fractured) crust on Earth ! And not only that !

It also caused global impact events on other planets and moons of our Solar System, and on millions of more planets and moons located in areas of our galaxy effected by the galaxy collision. But this is no wonder ! Because each of the mass (debris) streams which collided with our galaxy disk, and got absorbed by our galaxy during each of the pericenter (collision) events, reached a total mass in the order of 10^9 (1 billion) sun masses ! This gigantic mass streams caused extensive gravitational disturbances in the stellar disk of our galaxy, which enhanced and amplified the transient spiral modes in our galaxy. And they caused dense debris-streams in our galaxy, and debris-accumulations in the galactic (disc) plane.

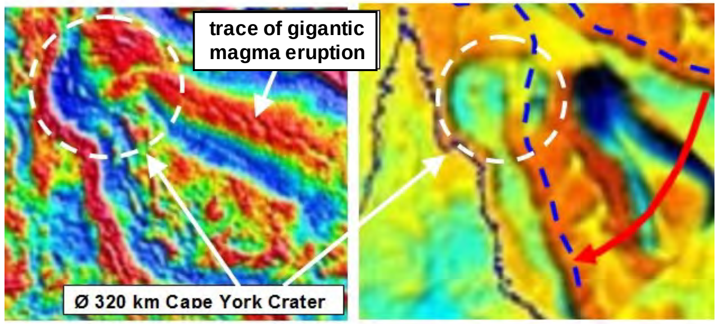
These streams of debris are the cause of the major periods of global impact events already described above, which happened either during each pericenter (collision) event or a certain (short) time after it, when our solar system came closest to the main debris (mass) stream.

However there are also periodic impact cycles (extinction cycles) noticeable on Earth which have a length of ~ 20 Ma and which occur precisely every 62 +/- 3 Ma. These impact cycles, which left clear evidence in the fossil diversity (fossil record) of our planet, in all probability are caused by a debris accumulation along the central plane (galactic plane) of our Galaxy. Because our solar system is moving along a spiral shaped path inside one of the spiralarms of our galaxy, it is periodically moving up- and down through the central galactic plane of our galaxy. This vertical (up- & down) oscillation of our Solar System about the central galactic plane has a period of ~ 66 +/- 6 Ma, which is in good agreement with the mentioned 62 +/- 3 Ma impact cycle (extinction cycle) on Earth. That's why it is only logical to assume that a disk (ring)-shaped accumulation of debris (→ asteroids, comets, dust) in the galactic plane, must be the cause of the 62 +/- 3 Ma impact cycle on Earth. This disk-shaped debris accumulation, which probably has some principle similarities to the debris-ring of Saturn, must be a longterm effect of the collisions (pericenter approaches) with the Sgr-DG. And the 62 Ma impact cycle doesn't produce global impact events on Earth in the same scale as the pericenter approaches with the Sgr-DG do. But it seems to be responsible for precisely 20 Ma long periods, every 62 Ma, with quite big impact events (like the Chicxulub Impact event), which can cause extensive mass extinctions on Earth, for example if these impact events trigger earthquakes & large scale volcanism on Earth. However the 62 Ma impact cycle isn't the root cause of global impact events ! The root cause of global impact events are the direct effects of the collisions (pericenter approaches) with the Sagittarius Dwarf Galaxy !

But back now to the Perm-Triassic (PT)-Impact :

The main impulse of the Perm-Triassic (PT)-impact on Earth initially caused a break-off of the Angara Craton from the Russian Craton and it caused a strong acceleration of the Angara Craton towards South, were China and Australia were located at that time. The following powerful southward movement of the Angara Craton then caused the HP & UHP orogens in China, through the strong compression which it produced in the crust fragments caught between the North China Craton & the Angara Craton. This dynamic process also led to the formation of the Altaid magmatic fronts.

In the NE & NW of Australia, off the coast, two exceptional large craters with ~ 350-400 km diameter can be indentified, which both seem to be secondary craters caused by ejecta from the PT-impact event. Here especially the Cape York impact crater located off the NE-coast of Australia must be mentioned, because it strongly influenced the tectonic development of the Pacific Plate through a number of gigantic magma eruptions.



The stratigraphic record of the NE-coast of Australia (e.g. “Moreton Geology”) indicates the probable connection of the Cape York crater, and its secondary impact structures, with the PT-impact event. At least eight (8) gigantic magma eruptions can be assigned to the Cape York Crater, which took place within the last ~200 million years. The fifth eruption of this series of magma eruptions, which was very powerful, not only left clear visible traces on the Pacific Plate. The magma front of this eruption also moved a small cratonic block (the Colorado Plateau) deep into the north-american continent. This has caused the formation of the Rocky Mountains and the Basin & Range Province. Further, a second magma front resulting from this eruption strongly influenced the geology of Antarctica, and it separated Antarctica from Australia & South-America. This eruption No.5 may have been triggered by extreme earthquakes, of magnitude >12 (on the Richter Scale), which were caused by the Chicxulub Impact Event ~65 Ma ago, and could therefore be partly responsible for the extinction of the dinosaurs.

The magma eruption No.6 of the Cape York crater left further distinct traces on the Pacific plate and it strongly influenced the geology of Mexico and of the Gulf of Mexico, when the magma front crossed this area. This magma front was also responsible for the formation of the Appalachians, which were created by a crust-fragment that was relocated (bended) towards the East by the magma front.

The 7th magma eruption of the Cape York Crater again left clear traces on the Pacific Plate. It strongly influenced the geology of Middle America when its magma front impacted there. The magma eruptions No.6 & 7 may have been triggered by strong impact-related earthquakes too (→ caused by the described 62 Ma impact-cycle).
A key map for the further analysis of these magma eruptions is the NOAA ocean floor map, which shows the topography of the Pacific Plate in fine detail. This map shows all the fine traces which will lead to the confirmation of these magma eruptions, and it will help to understand the dynamic geological processes caused by these magma eruptions, e.g. the separation of New Guinea & New Zealand from Australia, and the

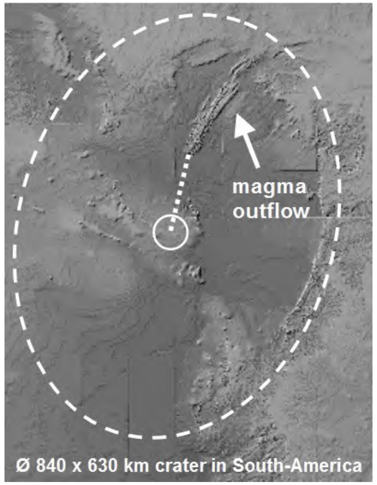
separation of Japan from New Guinea, the formation of Indonesia, French Polynesia etc.
Another key map is a global ocean-floor-age map (e.g. from Google). This map clearly shows the 1200-1600 km wide ocean-floor stripes (between 60°N and 30°S latitude) along which the magma fronts moved mainly from west to east. In the eastern half of the Pacific Plate these stripes are clearly visible because of the strong east-ward shift of their ocean-floor ages on the map, which was caused by an eastward acceleration of these stripes, resulting from the massive eastward directed magma outflows. The distinct bend in the Hawaiian-Emperor-Chain (starting at 43 Ma) is, at least partly, a result of the faster east-ward motion of 2 or 3 of these ocean-floor stripes over the Hawaiian hotspot, because these ocean-floor stripes were accelerated (& stretched) in eastward direction by the magma eruptions (-outflows).

Along the NE coast of Australia there are many other secondary impact structures noticeable, which all were caused by the Cape York impact event (e.g. a 30 km crater in the Mt. Warning area, or a 8 x 7 km elliptical crater in the Warwick area). These secondary impact structures will all be helpfull for a precise analysis of the impact scenario, which took place ~ 253 Ma ago.

The second large crater (diameter 400 x 350 km) located off the NW-coast of Australia is responsible for the ejection of large amounts of ejecta, rich in Platin-Group elements, which was distributed in a ray-like pattern over the Yilgarn Craton. The gravity anomaly map of Western Australia clearly shows these ejecta rays. A dense accumulation of this ejecta material can be found in the Kalgoorlie-Coolgardie-Kambalda area.
The crater off the NW-coast of Australia also seems to be responsible for the separation of Australia from India around 150-200 Ma ago. The gravity anomaly map shows two large cracks in Earth's crust which have their starting point in the center of this large crater, and which were caused, in all probability, by the two ejecta wings resulting from the oblique impact which formed this crater. A third large crack was caused by a particular strong ejecta ray from this crater, which separated Australia from Pangea (Africa) in the West and formed the western edge of the Yilgarn Craton.

Other possible secondary impact craters, caused by the PT-impact event, were found in India, in Arabia and in South-America. Here the 450 x 380 km elliptical crater identified in India, which formed the Bay of Bengal, seems to be related (identical) to the large secondary crater off the NW-coast of Australia. And a chain of large secondary impact craters, found on the gravity anomaly map of Arabia, must have caused the separation of Arabia from Eurasia and the separation of two smaller crust fragments from Arabia. (→ the first fragment is comprising the country Yemen & the second fragment is comprising the Hajar Mountain Range in Oman). And this chain of impact craters must be responsible for the formation of the large oil- & gas-fields in the impact area, which includes the Arabian Peninsula, Iraq and Iran.

Another large elliptical crater with a diameter of 840 x 630 km , found in South-America, which can be identified on topographic maps and on satellite images, may also be related to the PT-impact event. However it is not clear if it is another extremely large secondary crater caused by ejecta from the PT-impact, or if it was formed by a different impactor, or by a big part which broke off from the main impactor just before the PT-impact event occured.



Ø 840 x 630 km crater in South-America

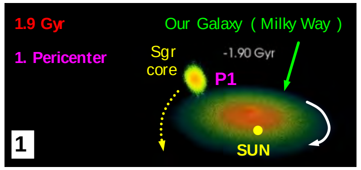
The special feature of this impact crater is a good visible ~ 30 km wide solidified magma stream which originates precisely from the center of the crater. This means that the impactor must have penetrated Earth's crust. And the resulting intense magma outflow has produced a large flood basalt area (LIP) north of the crater. This magma outflow may be responsible for the formation of the Central Atlantic Magmatic Province (CAMP), a vast tholeiitic flood basalt province in central Pangea, which started to form ~ 200 Ma ago (→ the true start probably was ~253 Ma ago !).

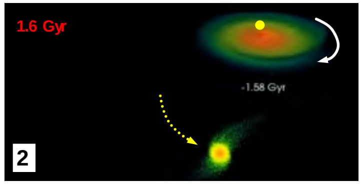
On the gravity anomaly map of Africa another large elliptical impact crater with the diameter of 1200 x 850 km can be identified. This crater is located in the Congo area and it seems to be responsible for the formation of the Congo basin. It is a quite complex impact crater which was formed by > 10 impactors. The impactors must have been the result of a large comet or asteroid which collapsed just before the impact. Because of the assumed impact direction and an estimated age of < 200 Ma, this impact event in the Congo area doesn't seem to be related to the PT-impact. However it certainly contributed to the break-up of the super-continent Pangea !

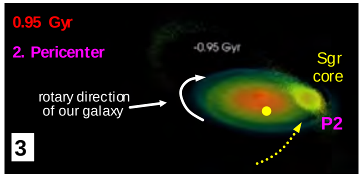
Another largescale impact event in Africa, which must be mentioned here, are four chains of impact craters (probably > 10 craters per chain), with craters in the Ø150 - 250 km range, which represent ejecta rays which cross the whole continent in different angle direction ! These impact craters are secondary craters, which were caused by ejecta originating in the PT-impact crater !

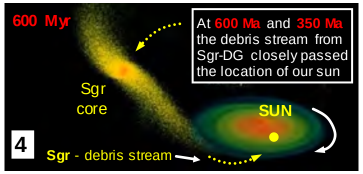
The angles between these "ejecta rays" can be used to localize the PT-Impact Crater at the time of impact and to reconstruct the precise location of Africa, in reference to Siberia, at the time of the PT-Impact Event !

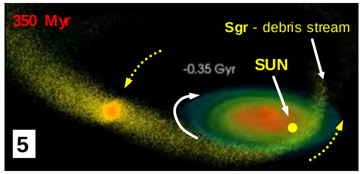
Introduction – Evidence for a fundamental cause of "Super-Continent Break-Ups" & Global Impact Events

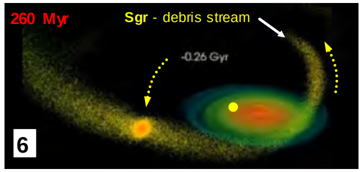


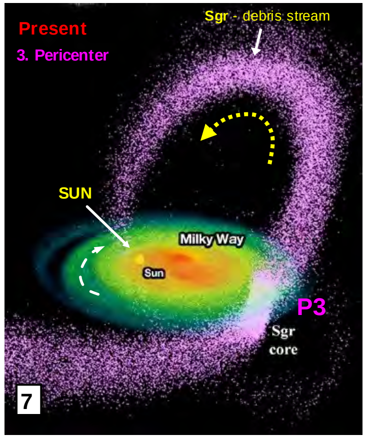





600 Myr
At 600 Ma and 350 Ma the debris stream from Sgr-DG closely passed the location of our sun
Sgr core
SUN
Sgr - debris stream
4







There is strong indication that the **Sagittarius Dwarf Galaxy (Sgr-DG)**, a companion of our own galaxy (Milky Way), is responsible for "periods of global impact events" in our solar system, and in million other solar systems as well ! This means that around each **pericenter event** of the **Sgr-DG** with our own Galaxy (→ pericenter event = closest approach between the mass centers (or a collision) of both galaxies), millions of planets in our galaxy were hit by large impactors (large debris) caused by the collision of the two galaxies.

During Earth's history there were at least three (maybe even 4 or 5) of the mentioned pericenter events. The image sequence on the left shows the last three pericenter events in quick-motion (images 1 to 7 & 1 to 4). The images are extracted from a super-computer simulation of the dynamic behaviour of the two galaxies over the last 2,65 Gyr's (1 Gyr=1 billion years). The key events are the three pericenter (P)-events (collisions, or closest approaches of the two galaxies). They took place at : **P1=1,9 Gyr**, **P2=0,9 Gyr** and **P3= 0 Gyr** (now !

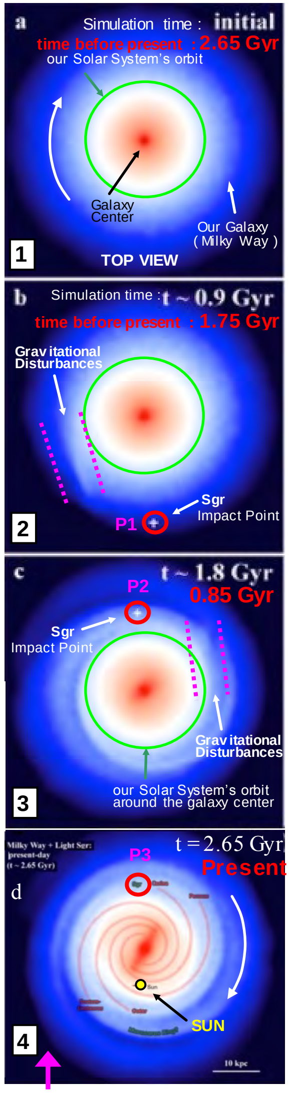

a
Simulation time : initial
time before present : 2.65 Gyr
our Solar System's orbit
Galaxy Center
Our Galaxy (Milky Way)
TOP VIEW
1
b
Simulation time : t ~ 0.9 Gyr
time before present : 1.75 Gyr
Gravitational Disturbances
P1
Sgr Impact Point
2
c
t ~ 1.8 Gyr
P2
0.85 Gyr
Sgr Impact Point
Gravitational Disturbances
our Solar System's orbit around the galaxy center
3
Milky Way + Light Sgr: present-day (t ~ 2.65 Gyr)
t = 2.65 Gyr
P3
Present
d
Sun
SUN
10 kpc
4

Figure 2 - **Face-on surface density visualizations of the Milky Way at four important moments during the *Light Sgr* simulation**. a, Initial model. b, Immediately following first pericenter, where the white cross marks the Sgr impact point. c, Shortly after second pericentric disk crossing. d, At the present-day (corresponding to elapsed simulation time 2.65 Gyr), overlaid by a four-armed symmetric-spiral fit to the observed arms of the Milky Way as revealed by mapping neutral hydrogen[23]. The traditional view of the Milky Way as a secularly-evolving system has encouraged theoretical descriptions of quasi-stationary density-wave spirality, although the large peculiar motions of young stars in spiral arms support a more transient picture[24] (numerical evidence exists for both short-lived configurations[25] as well as more stable forms of spirality, varying with the strength of the tidal induction[26]). Dynamical analysis of each impacted Milky Way model reveals the importance of the swing amplification mechanism, in which gravitational disturbances in the stellar disk at each pericentric approach shear into trailing arms that are subsequently enhanced on small scales (even in a globally stable system), strengthening transient spiral modes.

Here the weblink of the movie which shows the Dynamical Analysis of the galaxy collisions:
→ **Movie_Dynamic_Analysis**

The dynamical analysis of the three collisions (pericenters 1 to 3) of the Sagittarius Dwarf Galaxy with our own galaxy shows, that gravitational disturbances, which are caused on our galaxy disk at each collision, shear into trailing arms, which are then enhanced, strengthening the transient spiral modes of our galaxy. In other words this means that collisions of this Dwarf Galaxy with our own galaxy cause & intensify the spiral arms and spiral structure of our own galaxy. As everyone can imagine this has consequences for all solar systems located in the new created spiral arms caused (or later intensified) by these collisions ! The spiral arms created by the collisions are actually vortices of stars in which billions of solar-systems rotate around the bow-shaped center-lines of these spiral arms. And on each rotation around the center-lines of the spiral-arms the solar-systems cross the center-plane of the galaxy disk two times. (up- & down oscillation through disk)

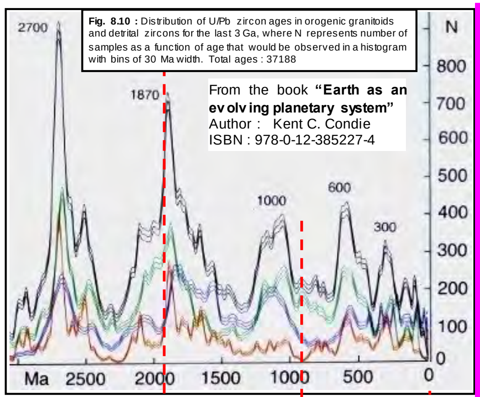
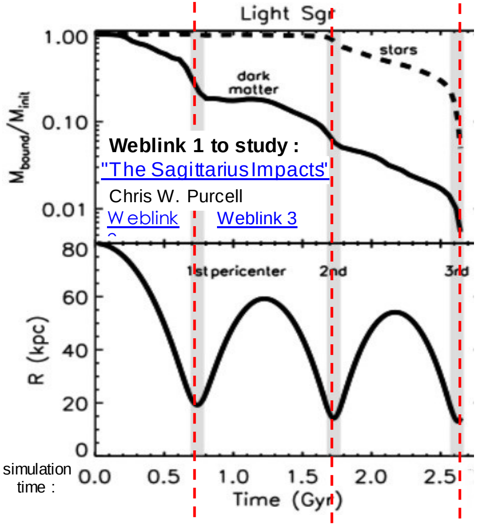


Fig. 8.10 : Distribution of U/Pb zircon ages in orogenic granitoids and detrital zircons for the last 3 Ga, where N represents number of samples as a function of age that would be observed in a histogram with bins of 30 Ma width. Total ages : 37188

From the book **"Earth as an evolving planetary system"**
Author : Kent C. Condie
ISBN : 978-0-12-385227-4

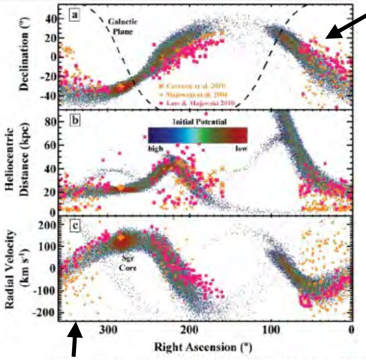


Weblink 1 to study :
"The Sagittarius Impacts"
Chris W. Purcell
Weblink
Weblink 3

time before Present : 1.9 Gyr **0.9 Gyr** **0 Gyr**

Figure S2 - The time evolution of bound mass and orbital radius in each simulated Sgr infall. Most mass loss occurs near the pericentric passages, marked by shaded bands. The dark halos in these satellite models both follow NFW density profiles with a scale length of 4.9 kpc for *Light Sgr*. We account for the mass loss that would have occurred between virial-radius infall and our initial Galactocentric radius of 80 kpc by truncating the Sgr progenitor mass at the instantaneous Jacobi tidal radius at that position, *i.e.* r_t = 23.2 kpc for the *Light Sgr* model. The total mass enclosed within this radius is $M_{Sgr} = 1.37 \times 10^{10} M_{\odot}$ for the *Light* model. These masses agree well with the pre-disruption mass estimates based on the stellar kinematics of the observed Sgr core and debris stream[7]. Implicit in our model is that the infall into the halo was recent enough that the first pericenter crossing modeled here was indeed the first close passage experienced by this satellite.

The diagrams on the left show that there is a distinct correlation between the U/Pb **Zircon** age peaks in orogenic granitoids (& detrital zircons) on Earth and the ages / times when the Sagittarius Dwarf Galaxy (S-DG) impacted on our own galaxy (→ pericenter events **P1** & **P2**). And because there is also a correlation between the Zircon age peaks and the break-up & formation of super-continents, it can be concluded that each pericenter event with the Sagittarius Dwarf Galaxy resulted in a super-continent "break-up" & "formation" cycle (or in a shattered crust) on Earth ! These "supercontinent cycles" must be the result of strong variation of "debris-flow" in our own Galaxy, caused by the collisions (pericenters) with the S-DG, which led to times with many global impact events on the planets of our solar system, when the debris flow was high, or they led to quiet periods with low debris flow → which then allowed planets to heal fractures in their crust caused by the global impact events. In the last 600 Ma (**P3**) more global impact events occured, because there was a constant debris flow of stellar material from S-DG through our Galaxy.



The S-DG debris stream :
→ comparison of the real and simulated debris stream

Our Galaxy's (Milky Way) data :
disk (galaxy) diameter: 120000 LY
disk height : 3000 - 16000 LY*
number of stars : 100 - 300 billion
orbit period of our solar system around the galaxy center : **230 Ma**
age of our galaxy : 13.6 Ga

Sagittarius Dwarf Galaxy :
disk diameter (core) : 10000 LY
number of stars : around 1 billion
age of galaxy : approx. 13 Ga
Orbital velocity : 140 – 170 km/s

LY* = Light Year

Figure 3 – **The observed Sgr tidal debris stream and remnant core in comparison to our *Light Sgr* simulation, in equatorial coordinates.** a, Declination versus right ascension. b, Heliocentric distance versus right ascension. c, Radial velocity versus right ascension. Simulated particles are colored according to their initial potential energy, and the orange points are data from 2MASS M-giant stars[27] and SDSS red-clump stars[28] (marked by squares and crosses respectively; thick crosses denote canonical values for the remnant core[2,12]). The pink points are 2MASS M-giants identified as likely stream members[5]. The present-day location of the simulated remnant and tidal arms are similar to those observed Combining this with observational constraints on the dispersion ($\sigma \sim 10 - 15$ km s^{-1}), breadth (8 – 10 kpc)[27] , and length of the observed debris stream provides some legitimacy for our model.

Introduction - Evidence for a 62 +/- 3 Ma cycle in Bio-Diversity on Earth, caused by big impact events

There is strong analytical evidence for a **62 +/- 3 Ma** cycle in Fossil Diversity (or Bio-Diversity). Sharp cuts in the bio-diversityon Earth clearly occur within **approx. 20 Ma (Myr) long extinction periods**. These sharp cuts all happen within the declining phases of the **62-Ma (Myr) cycle** (→ see sin-wave diagram **1c**).
Currently we live at the end of such an extinction period or declining phase of the 62-Ma cycle which is still going on for another 3 to 5 million years !! But it is obvious that there wasn't a similar sharp cut yet, in the current cycle, if compared with the past 8 cycles !

Note that in 6 of the past 8 cycles **at least 70%** of all marine species became extinct !!! (diagram 3). And in all 8 cycles the minimum percentage of extinct species was 40 %. However the current cycle doesn't show any cut in Bio-Diversity worth mentioning !! Have we just been very lucky ?, or is the cause of the sharp cuts in bio-diversity just a bit late in the current cycle which is still going on ?? Note : In cycles 5 and 8 a sharp cut occurred right at the end of each cycle ! (corresponds to eruptions & craters in Diagr. 2)

There are indicators in diagram 2 & 3 that the sharp cuts in bio-diverstiy may be caused by periods of large impact events. Note in **Diagram 2** the 5 large eruption events (which could have been caused by big impacts), which occurred within or very close to cycles 1 & 5-8, and the two large impact events in cycle 5 & 8 ! → also see **Diagram 3** !
It would be important to produce a more extensive and precise diagram to the age and size of large impact events & large eruption events with information to age tolerances !

The most plausible cause for the 62 +/- 3 Ma period "Big impact cycles" is **the periodic crossing of the galactic plane by our Solar System**. The glactic plane may be full of debris (asteroids & comets) similar to the debris in Saturn's Ring-plane. The **62 +/- 3 Ma** Bio-Diversity cycle is in good agreement with the **66 +/- 6 Ma** period for the vertical oscillation of our Solar System about the plane of our galaxy ! Note that it seems that the last crossing of the galactic plane occurred ≤ **3 Ma ago !,** which is approx. 5 to 7 Ma after mid of the calculated extinction cycle !! → see weblinks : 1.) Weblink Study 1

2.) Weblink Study 2

"Cycles in Fossil Diversity "
by Robert A. Rohde and Richard A. Muller
Weblink to Study : http://muller.lbl.gov/papers/Rohde-Muller-Nature.pdf

Diagram 1e : Shows the Fourier Spectrum of the short-term variations of the bio-diversity on Earth. The Fourier Spectrum is dominated by a **strong spectral peak with period 62 +/- 3 Myr.** The **sin wave** corresponding to this cycle is shown in **Fig. 1c** where it accounts for 35% of variance.

Diagram 1e also shows a second spectral peak with period 140 +/- 15 Myr.

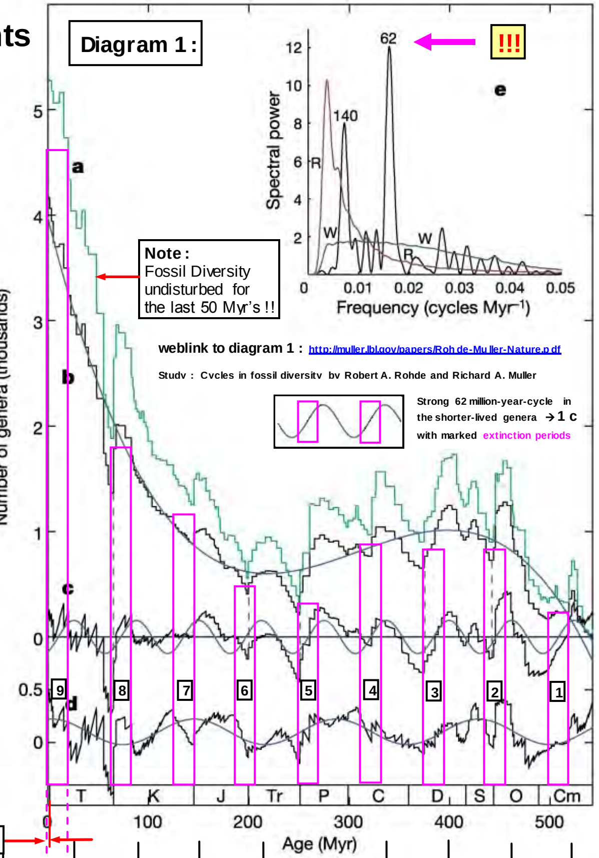
The 62-Myr cycle is very significant. By contrast the 140 Myr cycle can plausibly result from random processes.

Although no explanation exists, the 62-Myr cycle is not a subtle signal. It is evident even in the raw data (Fig. 1a), dominant in the short-lived genera (Fig. 2) and strongly confirmed by statistical analysis. It implies that **an unknown periodic process** has been **having a significant impact on Earth's environment** throughout the Phanerozoic. The author considers the following physical processes : periodic comet showers triggered by a companian star or a planet X or by the oscillations of our solar sytstem up- and down the galactic plane every 52-74 Myr or by periodic crossings of spiral arms, or periodic mantle plume cycles & volcanism cycles, or longterm solar cycles.

full web-addresses
1.) http://www.nature.com/nature/journal/v316/n6030/abs/316706a0.html
2.) http://www.nature.com/nature/journal/v314/n6006/abs/314073a0.html

3 - extinction period left ~ 3 - 5 million years
2 – extinction period approx. 20 million years
1 - fossil diversity cycle 62 +/- 3 million years

Diagram 1 :



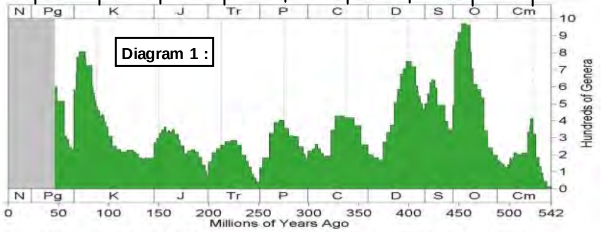
Note :
Fossil Diversity undisturbed for the last 50 Myr's !!

weblink to diagram 1 : http://muller.lbl.gov/papers/Rohde-Muller-Nature.pdf

Study : Cycles in fossil diversity by Robert A. Rohde and Richard A. Muller

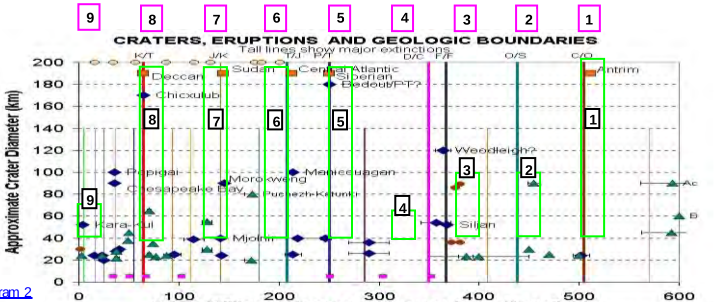
Strong 62 million-year-cycle in the shorter-lived genera → 1 c with marked extinction periods

Diagram 1 :



Fossil Diversity. All 13,682 short-lived (< 45 Myr) genera listed by Sepkoski are plotted. The dotted lines are spaced 62 Myr. (Rohde & Muller, Nature, vol 434, 208-210, 10 March 2005)

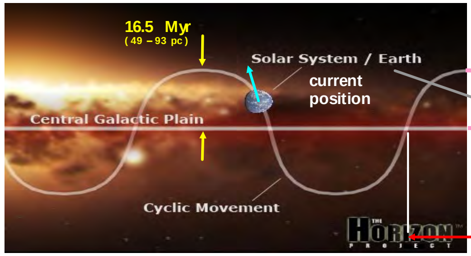
Diagram 2 :

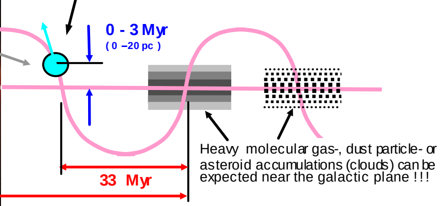


- ◆ CRATERS - CLOSE
- ■ ERUPTIONS - CLOSE
- ▲ Crater - other
- ○ Eruptions - other
- Devonian/Carboniferous
- Carboniferous/Permian
- Permian/Triassic
- Triassic/Jurassic
- Early/Middle Jurassic
- Jurassic/Cretaceous
- Aplian/Albian
- Cenomanian/Turonian
- Cretaceous(K)/Tertiary
- Paleocene/Eocene
- Eocene/Oligocene
- Oligocene/Miocene
- Early/Mid Miocene
- Miocene/Pliocene
- Pre D.
- Proterozoic/Cambrian
- Cambrian/Ordovician
- Ordivician/Silurian
- Silurian/Devonian
- Frasnian/Fammenian
- ● IMPACTS - NO CRATER
- ■ LUNAR SPHERULES

Graph by Michael Paine. Thanks to Andrew Glikson, Franco Pirajno and Dallas Abbott. Updated March 2001

weblink to diagram 2 : Weblink Diagram 2





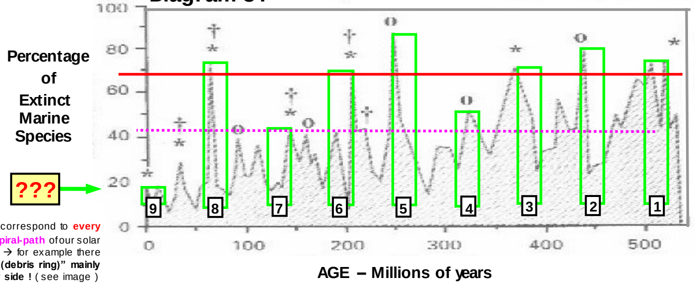
Heavy molecular gas-, dust particle- or asteroid accumulations (clouds) can be expected near the galactic plane !!!

† **Large well-dated Impact Craters**

* **Diagnostic evidence of Impact**

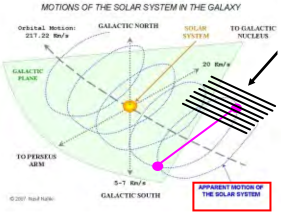
θ **documented Iridium Spikes**

Diagram 3 :

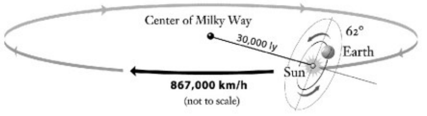


weblink to diagram 3 : Weblink Diagram 3

Study : Impacts and Mass Extinctions by Michael R. Rampino :
Weblink : http://adsabs.harvard.edu/full/1996EM%26P...72..441R



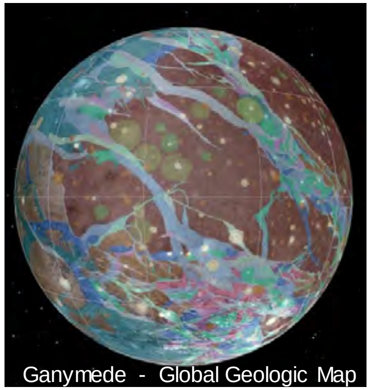
The logical reason why large impact events mainly correspond to **every second crossing** of the galactic plane could be the **spiral-path** of our solar system on it's way around the center of our galaxy. → for example there could be **a "heavy dust- & asteroid accumulation (debris ring)" mainly on one side of the spiral path and less on the other side !** (see image)



prepared by Harry K. Hahn , 29-9-2013

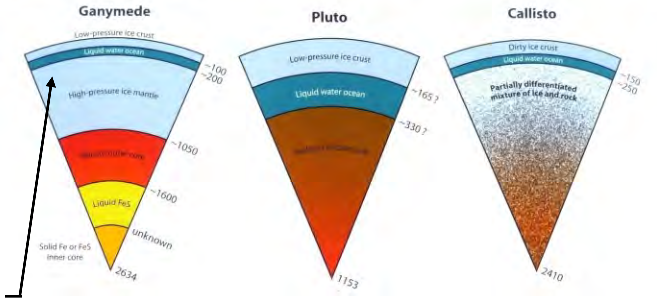
Introduction - The cause of expansion tectonics : A global impact event combined with a mantle super-saturated in volatiles

High concentrations of volatiles in the mantle of certain planets & moons may be the driving force for their rapid expansion , after a global impact event has caused extensive fractures in their crust. → The global impact event and the fractures in the crust are the trigger, which initiate the expansion of the planet or moon through abrupt decompression of the mantle. Then the volatiles in their mantle e.g. **CO_2, H_2, SO_2, H_2S** etc. → **but especially H_2O**, which may be in a super-saturated state, cause the rapid expansion of the mantle, and the formation of ice-crusts, oceans & atmospheres on their surfaces → as seen on Earth, Mars, Ganymede, Enceladus & Pluto etc. (→ see this study !)



Jupiter moon Ganymede is definitely one of the most obvious examples of global expansion tectonics. It is easy noticeable that the (old) brown colored areas represent fragments of a sphere which drifted away from each other. The fragments of these shattered (older & smaller) sphere seem to get pulled apart from each other by an expanding sphere (→ the expanding mantle) underneath. The cause of the fractures in the old (brown-colored) crust and the trigger of the expansion tectonics was a global impact event ! (see chapter 6 in this study !) And the substance which is driving the obvious expansion of the moon must be **H_2O** ! Because the mantle of Ganymede pretty much only consists of water in different aggregate states ! → See diagram on the righthand side ! This expansion only slightly increases the moon's moment of inertia

Figure 3.15 Idealized interiors of selected icy bodies (depths in kilometres). Comparatively minor differences in history, composition, and location have produced a wide range of internal structures and geological processes in the larger satellites and dwarf planets. (Various sources.)



Inner structure of Ganymede, Pluto & Callisto

Table 2.5 : Average Chemical Composition in % of Continental and Oceanic Crust

	Continental Crust				Oceanic Crust
	Upper	Middle	Lower	Total	
SiO_2	66.3	63.5	53.4	60.6	50.5
TiO_2	0.64	0.69	0.82	0.72	1.6
Al_2O_3	15.4	15.0	16.9	15.9	15.3
FeOT	5.04	6.02	8.57	6.71	10.4
MgO	2.48	3.59	7.24	4.66	7.58
MnO	0.10	0.10	0.10	0.10	0.19
CaO	3.59	5.25	9.59	6.41	11.3
Na_2O	3.27	3.39	2.65	3.07	2.68
K_2O	2.80	2.30	0.61	1.81	0.11
P_2O_5	0.15	0.15	0.10	0.13	0.2

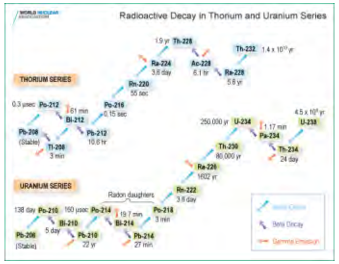
Composition of Earth's mantle in weight percent

Element	Amount	Compound	Amount
O	44.8		
Mg	22.8	SiO_2	46
Si	21.5	MgO	37.8
Fe	5.8	FeO	7.5
Ca	2.3	Al_2O_3	4.2
Al	2.2	CaO	3.2

Important indicators which support the Expansion Tectonics Hypothesis (→ see description below) :

1) Earth's mantle contains **0,5 – 2 wt% H_2O** . But because the mass of water (**H_2O**) in the mantle is poorly constraint, the real value could be much higher !
2) A comparison of Earth's mantle with the mantle of other planetary bodies with high concentrations of H_2O on their surfaces (see diagram), indicates that the **wt% of H_2O** in Earth's mantle maybe considerably under-estimated !
3) Different analyses indicate that Earth's radius is expanding with 4 to 15 mm/y This means Earths diameter increased by **2000-7500 km** in the last **250 Ma !**
4) The 12 km "Kola super-deep Borehole" showed that at depths >7 km the **rock is extremely fractured** and **saturated with H_2O & Hydrogen** from deeper sources !
5) The **H_2O** in Earth's mantle is super-critical & behaves like a gas (Study1, http://)
6) **Helium-3** and **Tritium** detected on Mauna Loa / Hawaii indicate the production of Hydrogen-3 (**Tritium**) by ternary fission in Earths core. **See :** https://books.google

Other interesting information: Study1, Study2, Study3, Study4, Study5, Study6 Study8, Study9



Hypothesis : → Process for the expansion of the mantle which is causing expansion tectonics :

1.) First we consider a crust of a planet or moon which is stable (→ undamaged by big impacts) for a long time period (> 200 Ma). Underneath this stable crust, which is acting like the wall of a pressure vessel, volatiles accumulate within the mantle material over a long time. These volatiles are produced by different processes inside the mantle. At the beginning the mantle material of the planet or moon contains these volatile components in a dissolved state. However pressure and temperature in the mantle increase over time, because more and more volatiles accumulate within the mantle material, and because radioactive decay is constantly adding heat. The solubilities of the volatiles depend on pressure, temperature and the composition of the mantle material. When solubility decreases below volatile concentration, the volatiles will exsolve and start to form small gas bubbles in the mantle material

2.) At this point the mantle material is super-saturated with these volatiles. And with further increasing pressure within the mantle material, finally the point will be reached where the pressure in the mantle exceeds the pressure caused by the lithostatic load (weight) of the crust. This is the point when tensile stress will start to build up inside the crust material of the planet or moon, which allows the pressure within the mantle to increase even further ! (→ like in a pressure vessel). This build-up of stress in the crust can go so far, that the crust is close to fracturing through tensile stress ! In this state the crust will be very vulnerable to impact events ‼ The extremely fractured rock found at depths >7 km maybe proof of this ‼ (Note that Earth's mantle contains at least 0,5 - 2 % H_2O !)

3.) If one or more large impactors are hitting the crust of the planet or moon in this state, the fracturing of the crust will be particularly extensive because it was already close to fracturing through increased tensile stress. And as soon as the crust is fractured by the impact(s) the mantle material will start to expand rapidly. Because volatile solubility in the mantle material (magma) decreases through the rapid pressure drop in the mantle, caused by the fracturing of the crust, more and more gas will exsolve ‼ And the mantle expands faster and faster because of growing gas-bubbles within the mantle material. Heat from the impact event is contributing to this process !

4.) A self-accelerating process is initiated which only stops when a new equilibrium is reached between the decreased pressure in the mantle and the pressure produced by the new (thinner) overlying crust, which is caused mainly by gravity and not by the constraint of a closed spherical shell (a pressure vessel wall) anymore. Because of the grown gas-bubbles the mantle-density dropped considerably

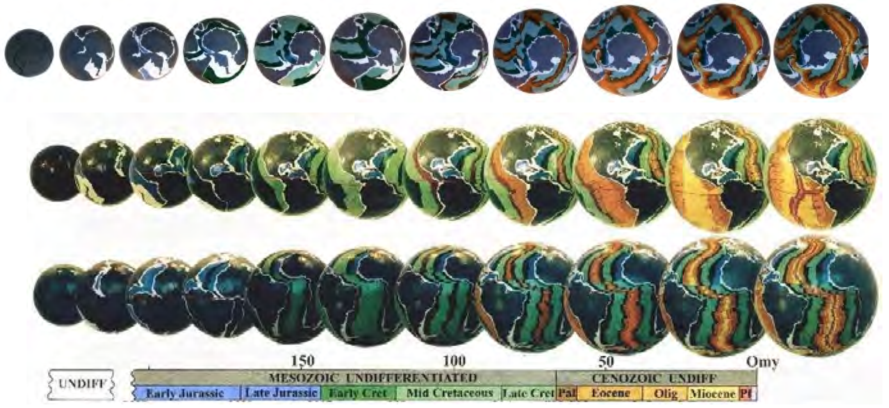
Expansion Tectonic Earth models :

From James Maxlow & other geologists and geo-physicists which support this Theory :

Web-Links : L1, L2+L3, L4, L5, L6, L7+L8, L9, L10

Present-day major heat-producing isotopes

Isotope	Heat release [W/kg isotope]	Half-life [years]	Mean mantle concentration [kg isotope/kg mantle]	Heat release [W/kg mantle]
^{238}U	9.46×10^{-5}	4.47×10^{9}	30.8×10^{-9}	2.91×10^{-12}
^{235}U	5.69×10^{-4}	7.04×10^{8}	0.22×10^{-9}	1.25×10^{-13}
^{232}Th	2.64×10^{-5}	1.40×10^{10}	124×10^{-9}	3.27×10^{-12}
^{40}K	2.92×10^{-5}	1.25×10^{9}	36.9×10^{-9}	1.08×10^{-12}



Introduction - Oblique Impact Craters & Impact Structures formed by several Impactors

Prepared by Harry K. Hahn

To understand what happens when an asteroid or comet impacts on a planetary body, here a few examples of oblique impact craters and impact structures formed by several impactors (→ impactors which broke apart) :

Here we don't consider the case where the impact angle is 90° and a simple circular impact crater is formed.

The following images show what happens if an impactor (asteroid of comet) impacts on the surface of a planet or moon in a shallow angle, and what impact structures are formed by impactors which break apart just before impact

The following facts of such "oblique impacts" with a shallow impact angle should be kept in mind :

1.) An elliptical impact crater is formed during impact

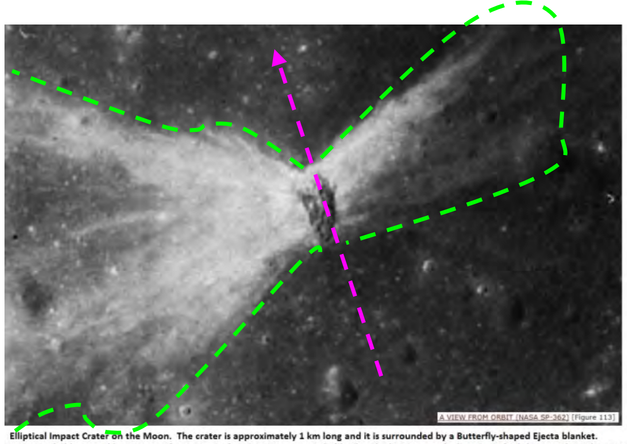
2.) Oblique impacts (2) produce a butterfly-shaped ejecta blanket with two mostly forward directed wings

3.) The ejecta blanket is formed by multiple ejecta lobes

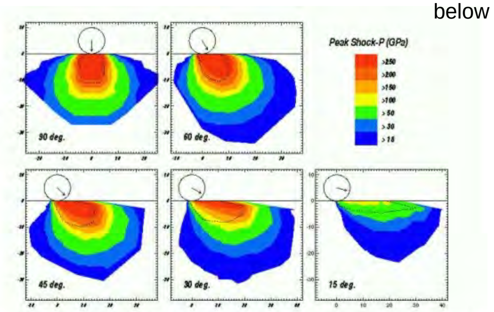
4.) The smaller the impact angle the more ejecta is thrown out without being melted → see below

5.) There is often a blow-out rim on the rear end of the crater visible. (the crater has a flat end)

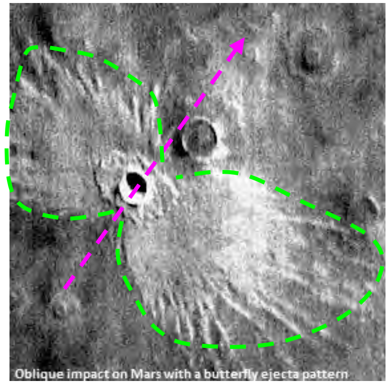
6.) At multiple impact craters "ejecta strings" along the borders between the separate shock fronts are caused (accumulation of ejecta along lines)



Elliptical Impact Crater on the Moon. The crater is approximately 1 km long and it is surrounded by a Butterfly-shaped Ejecta blanket. It was probably caused by a group of impactors. The main impactor probably already desintegrated when it reached the moon's Roche Limit

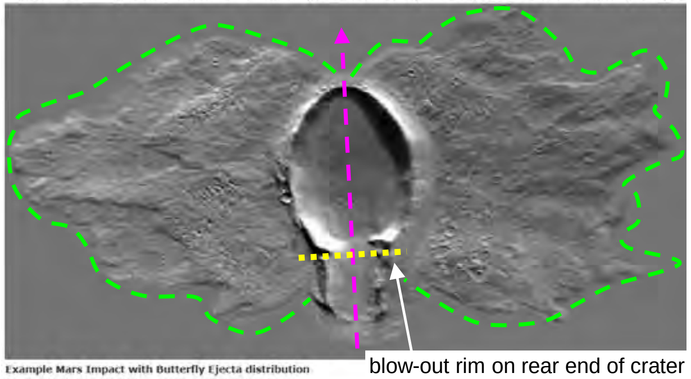


In the range of shock pressures at which most materials of geologic interest melt or begin to vaporize, we find that the volume of impact melt decreases by at most 20% for impacts from 90° down to 45°. Below 45°, however, the amount of melt in the target decreases rapidly with impact angle. Compared to the vertical case, the reduction in volume of melt is about 50% for impacts at 30° and more than 90% for a 15° imapct. These estimates do not include possible melting due to shear heating, which can contribute to the amount of melt production especially in very oblique impacts.



Oblique impact on Mars with a butterfly ejecta pattern

Imaging of the surface areas of our solar system's terrestrial planets and moons has show that approximately 5% of all craters are created during low angle of incidence [oblique] impacts. These events create a set of recognizable characteristics: oval shape, butterfly ejecta pattern, "no-fly" ejecta area up field, and "blow-out" rim down field. These are sometime seen in a "train" of craters, where the impactor had been fragmented to a stream of individual components due to atmospheric disruption or Roche tidal disruption prior impact



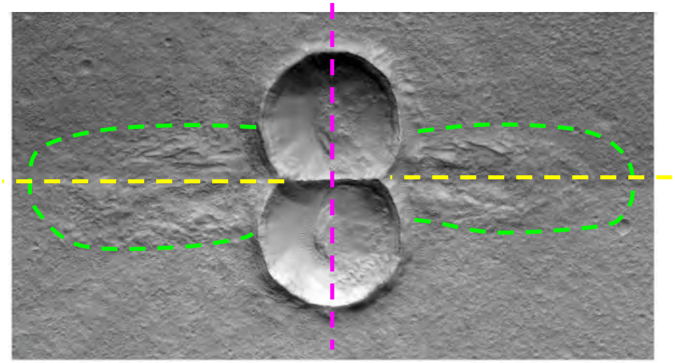
blow-out rim on rear end of crater

Example Mars Impact with Butterfly Ejecta distribution

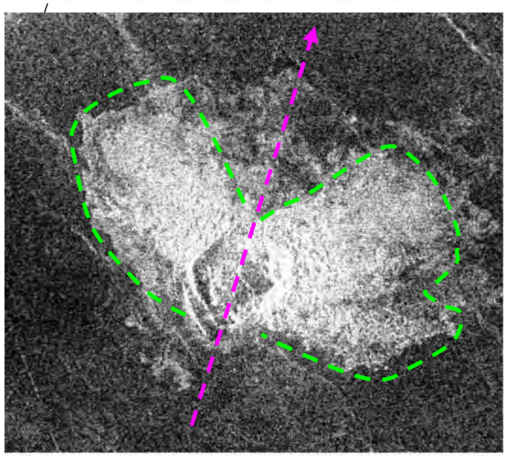
Credit: NASA / JPL / ASU / mosaic by Emily Lakdawalla

Owing to the atmospheric drag, a string of fragmented impactors would differentiate during decent, with the larger bodies tending to travel further than smaller ones.

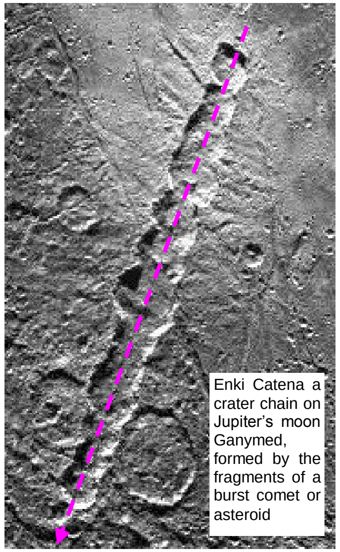
We call special attention to the work of Schultz and Stickle (Lost Impacts), which explains how shallow angle of incidence (oblique) impacts generate "impact" structures that are significantly different from the classic, better understood, crater planforms. We proposed the Saginaw impacts to have been at an angle of less than 5 degrees - nearly tangential. The craters generated would manifest



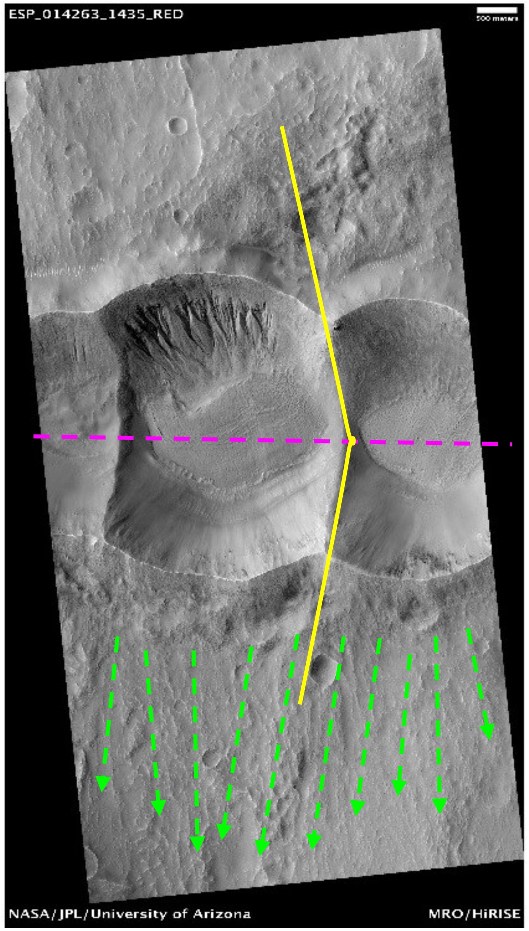
22. On to Mars next - this image shows a remarkable double crater with a shared rim and North-South trending ejecta deposits. These two craters must have formed simultaneously. Image acquired in February, 2011 by NASA's High Resolution Imaging Science Experiment (HiRISE), a camera on board the Mars Reconnaissance Orbiter (MRO). (NASA/JPL/University of Arizona)# ■ #



A 50 km wide radar image showing an 8 km diameter impact crater on Venus. The asymmetric distribution of the bright ejecta indicates that this crater was formed by an oblique impact, by a approx. 200 m object arriving from the south at a speed of maybe 20 km/s.

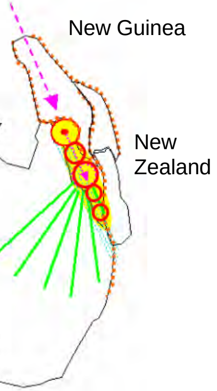


Enki Catena a crater chain on Jupiter's moon Ganymed, formed by the fragments of a burst comet or asteroid



1 A big impact event caused a crater with ≥ ∅ 320km on the NE-coast of Australia ~ 253 Million years ago

The geological map of the NE-coast of Australia indicates that this enormous impact event occurred at the PT-boundary and that it had two main chapters. The first chapter was written by the impact itself, which produced an ejecta blanket which covered the east of Australia, especially the coastal areas. The second chapter probably was initiated by a flood event, starting ~200 Ma ago, caused by a magma eruption from the CY-crater.



The Cape York Impact Event :

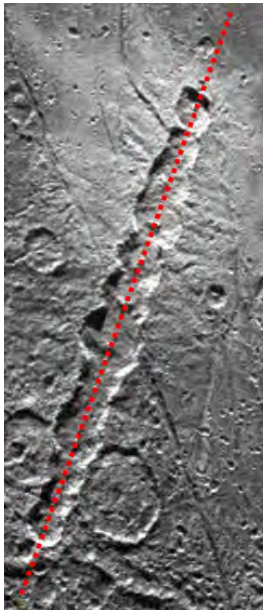
The following images show, that there was either one (red), or a chain of successive large impacts (blue) which have caused the break-off of New Zealand and New Guinea from the Australian Plate. (see an example of a chain of impact craters on the left image below)

An impactor chain would provide an explanation for the cause of the large crack in Earth's crust required for such a break-off of big crust fragments ! Further it would also explain the cause of the different ray systems visible on the gravity anomaly map. The impactor or the chain of impactors were either ejecta of the PT-Impact.(see Chapter 2) or part(s) of the PT-impactor, which broke apart before impact.

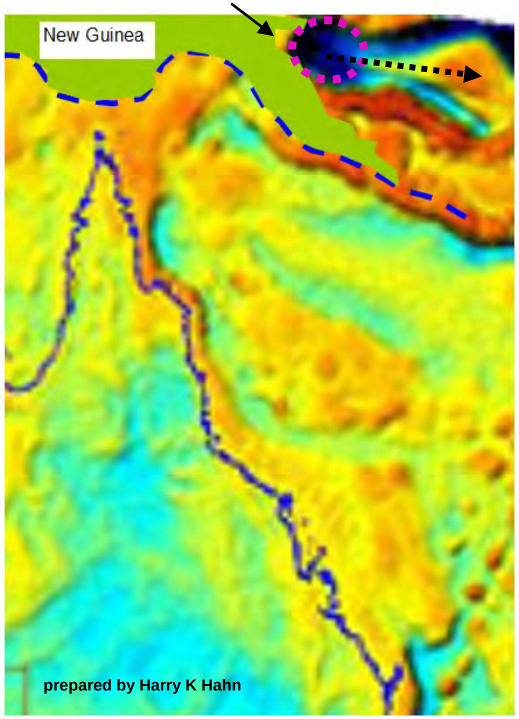
Modification of a Gravity Anomaly Map of Australia's East Coast to show the original impact structure

The image on the left shows the unchanged gravity anomaly map, with New Guinea marked in green on the map. (→ New Guinea's coast line is marked in blue) In the right image, the section in the top right area of the map was rotated by a 45° angle towards the north-east coast of Australia. The result of this "reconstruction" shows the original state of the impact structure shortly after the impact event took place ! The circular crater structure with a diameter of around 320 km is clearly visible ! And the border structures with high gravity intensity indicate that the impact structure may have been caused by a chain of impactors. (probably by a number of secondary impactors from the PT-Impact) Each of the further 3 to 4 big impacts having a diameter of 200 to 300 km !!

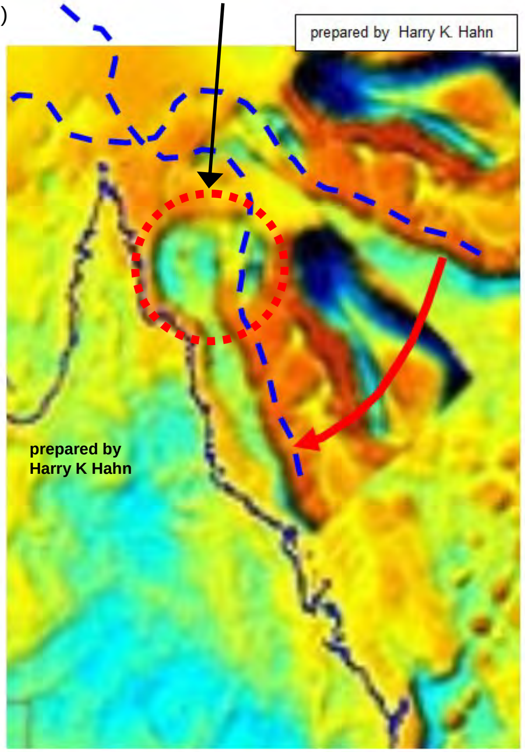
Example of a chain of craters on the Jupiter moon Ganymede caused by an impactor which broke apart before impact :



Also note the magma flow (yellow) which obviously came from the dark blue area (an outflow channel in the crust ?)



Note the circular crater structure of a large 300 km crater which is cleary visible now !

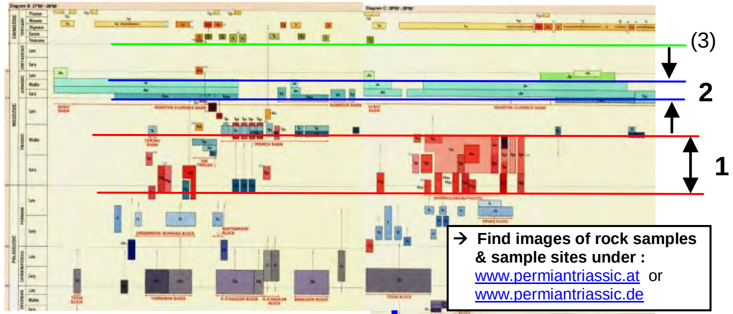


The geological map of the SE-coast of Queensland indicates two main chapters associated with the large impact event :

1.) Ejection of the red-colored rock types along the East Coast of QLD at ~253 Ma. → Crystallization of this "ejecta ranges" until ~ 225 Ma

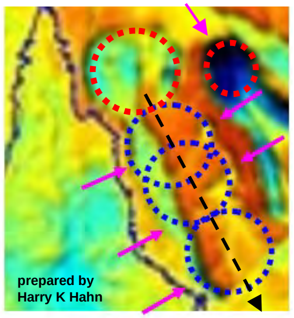
2.) A gigantic flood event triggered by magma eruption 1, ~200 Ma ago and effecting the low-lying sedimentary areas until around 160 Ma

(3.) Volcanic activity initiated at around 65 Ma and lasting until ~25 Ma → probably related to magma eruptions No.5 to 8 of Cape York Crater



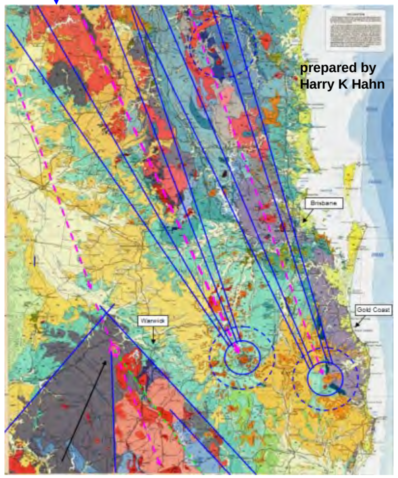
→ **Find images of rock samples & sample sites under :**
www.permiantriassic.at or
www.permiantriassic.de

Map : -**Moreton (Warwick) Geology-**
Geology Maps → type in : **WARWICK**



The bow-shaped border structures with a high gravity intensity could indicate that the impact event was indeed caused by a chain of impacts.

the lines on the geological map indicating the impact ejecta areas



prepared by Harry K Hahn

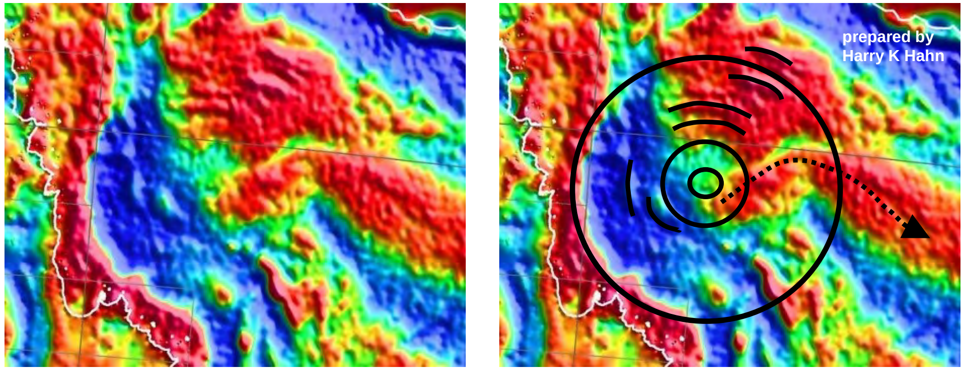
Cape York Crater ∅ 320 km (NE-Queensland / Australia)

Detail view of the large Impact Crater near Cape York :

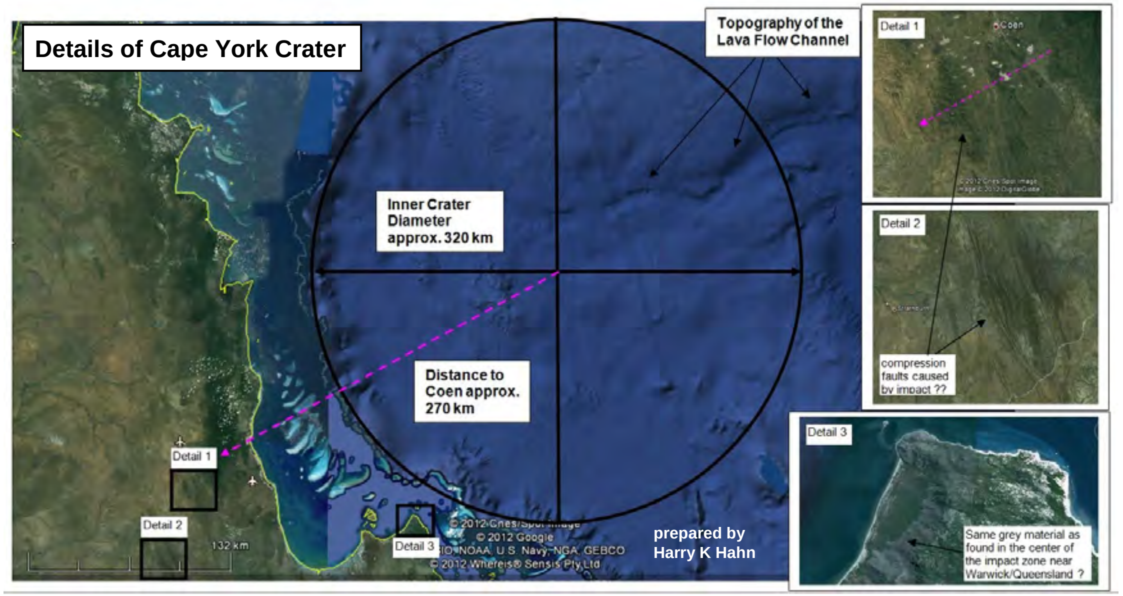
This crater which is clearly visible on different gravity anomaly maps of Australia initiated the break-off of New Guinea & New Zealand from the Australian Plate !

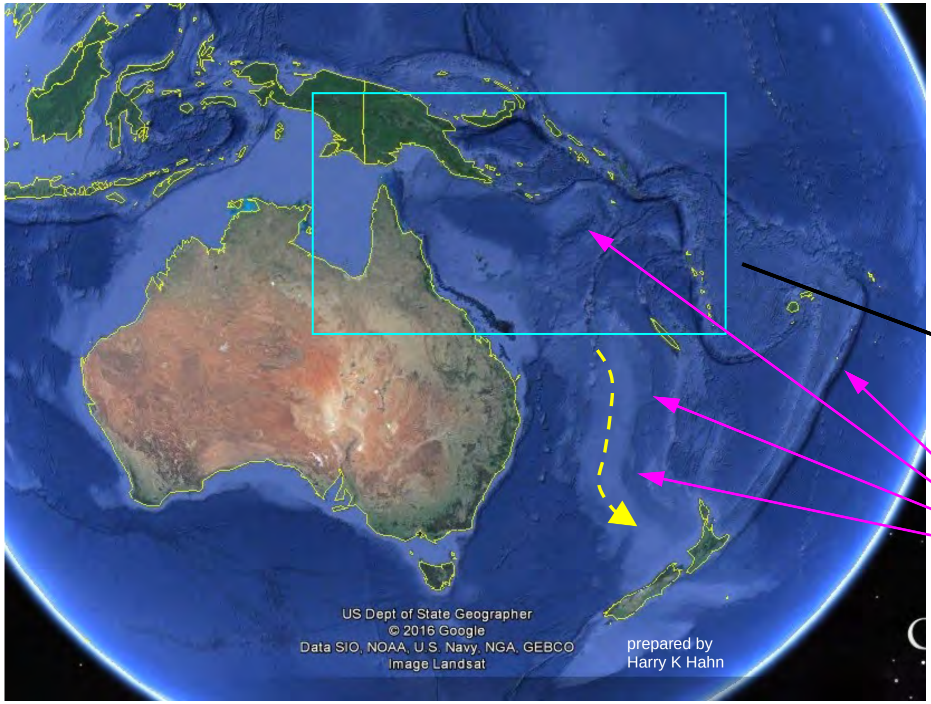
(And if there was a chain of craters, then this was probably the biggest one !)

Gravity Anomaly Map :



Cape York Crater on a Topographic Map : (→ Detail from the image below


Details of Cape York Crater
Topography of the Lava Flow Channel
Inner Crater Diameter approx. 320 km
Distance to Coen approx. 270 km
Detail 1
Detail 2
Detail 3
132 km
© 2012 Cnes/Spot Image
© 2012 Google
SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2012 Whereis® Sensis Pty Ltd
prepared by
Harry K Hahn
Detail 1
Coen
© 2012 Cnes/Spot Image
Image © 2012 DigitalGlobe
Detail 2
compression faults caused by impact ??
Detail 3
Same grey material as found in the center of the impact zone near Warwick/Queensland ?

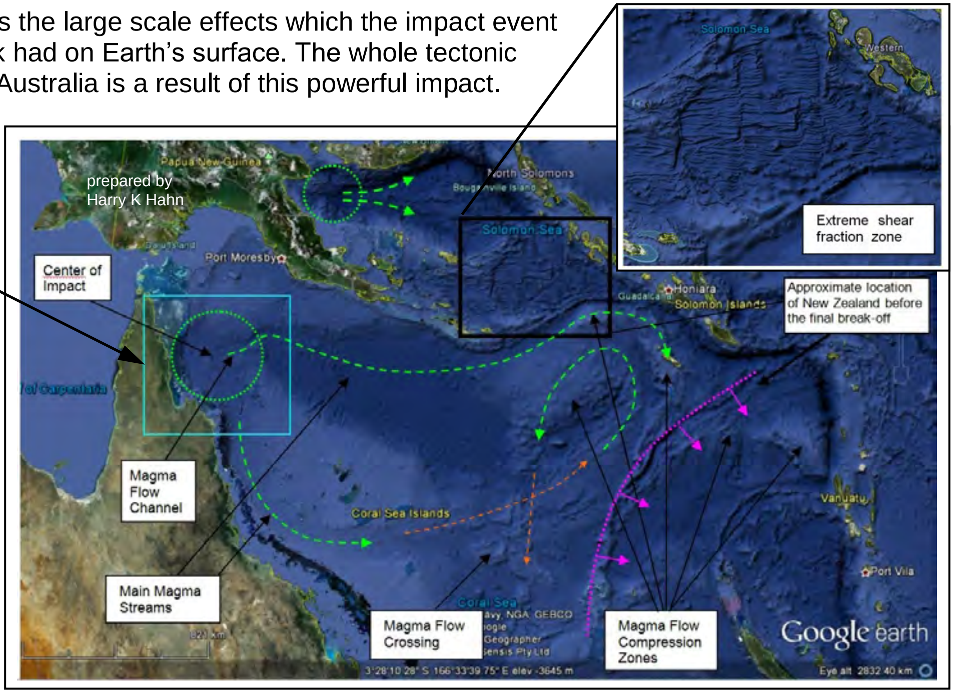

US Dept of State Geographer
© 2016 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
prepared by
Harry K Hahn

Details of Crater see above

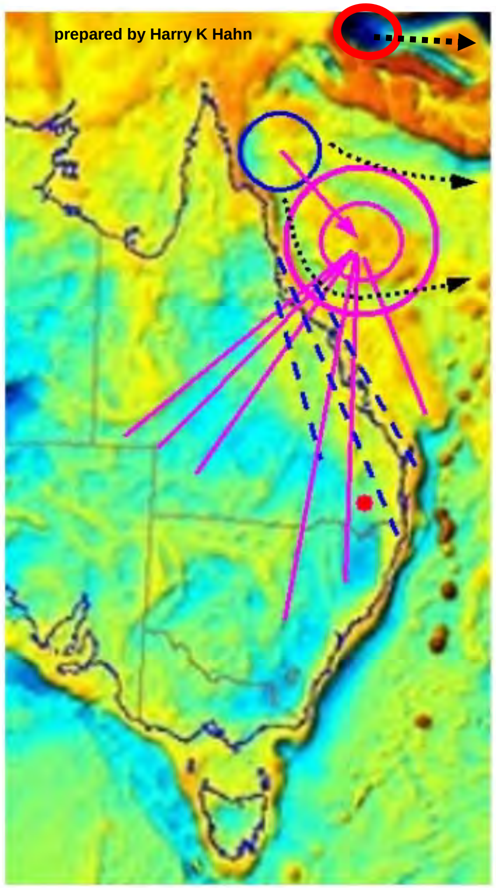
large scale magma flow traces

Detail of Magma Flow Traces visible on a topographic map :

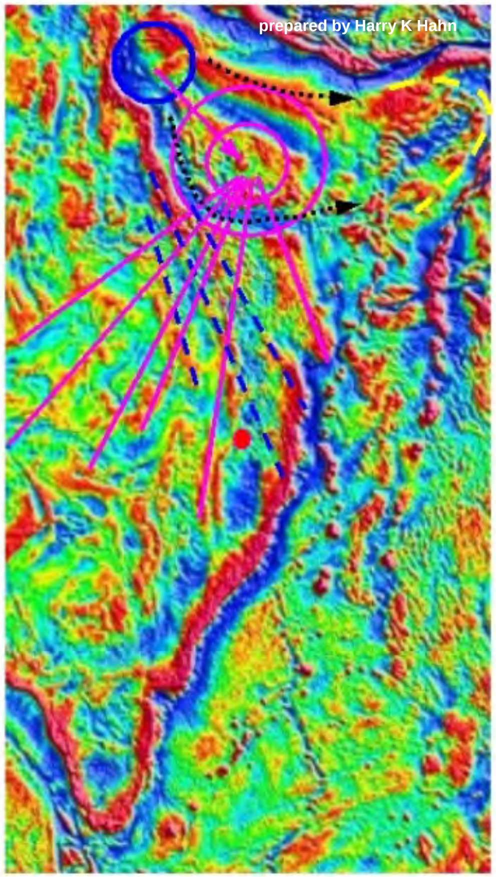
This map shows the large scale effects which the impact event near Cape York had on Earth’s surface. The whole tectonic activity east of Australia is a result of this powerful impact.



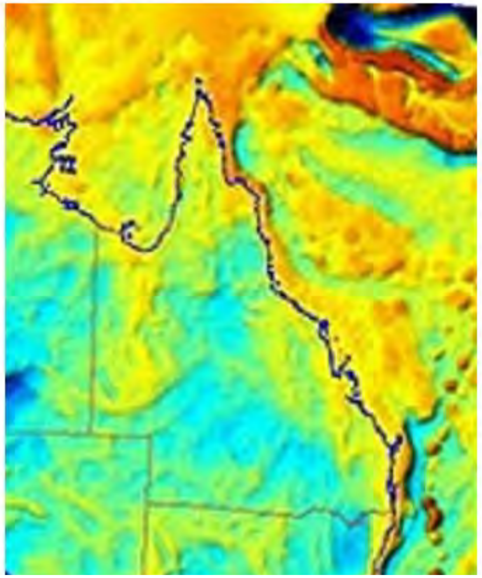
Gravity Anomaly Map 1

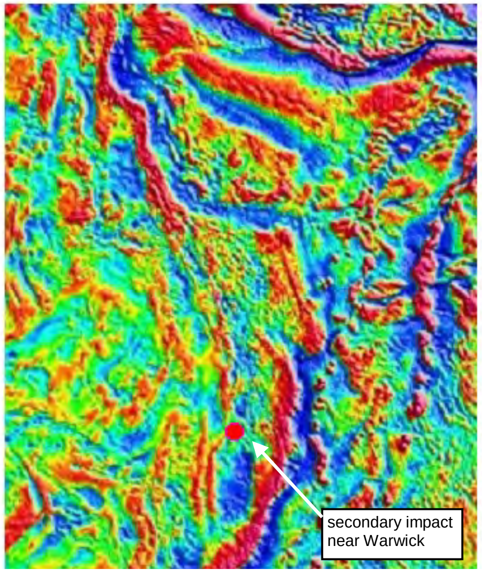


Gravity Anomaly Map 2

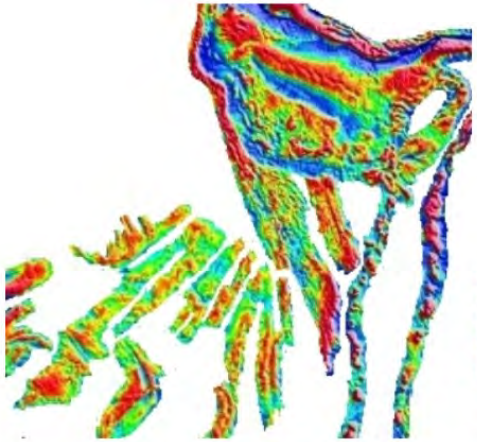


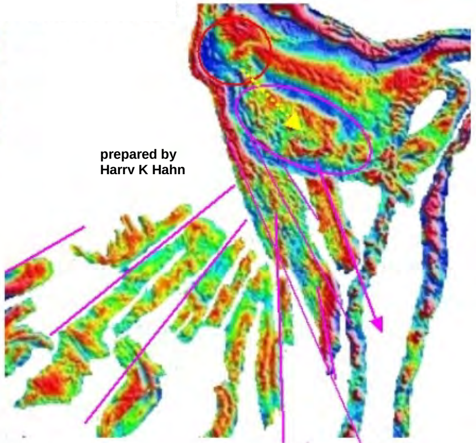
Maps without markings (for comparison) :

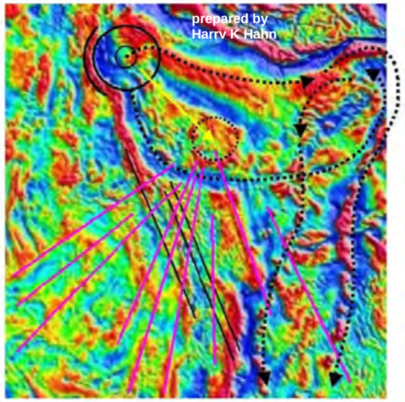


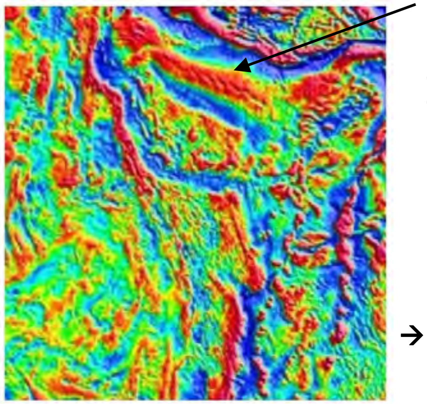


Main structures of the large Impact Event near Cape York / in NE-Australia









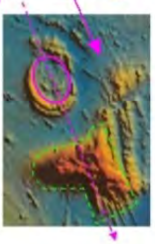
Note the traces of a massive & powerful magma flow, which came from the center of the crater.

→ for comparison of the orientation also the small elliptical structure in SE-Queensland is shown (approx. 50 times enlarged !)

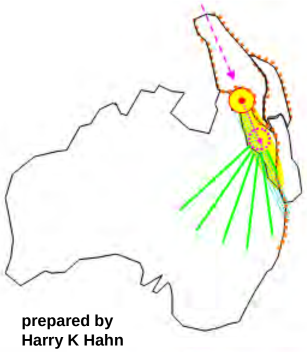
→ secondary impact near Warwick

→ see also the Chapters describing the Warwick Impact & Mt Warning Impact

The two pink colored arrows shown in the smaller rectangular image indicate the interdependence between the assumed large impact in the North of Queensland and the assumed smaller elliptical Impact Structure in South-East Queensland.
The main impact direction of the smaller elliptical structure is identical to the direction of the thin ray structure of the larger impact structure



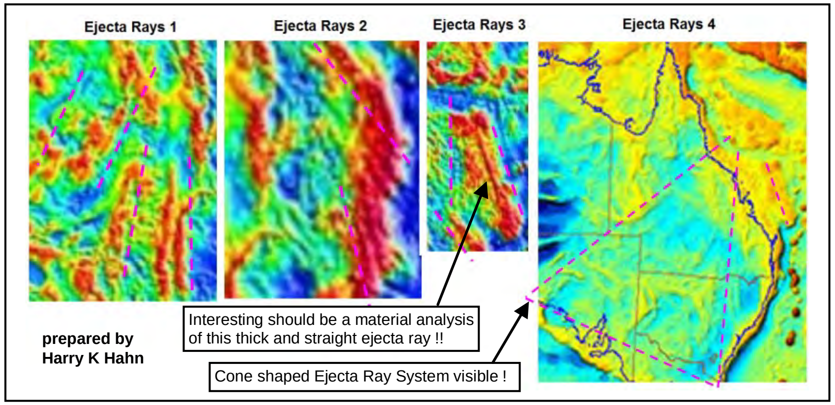
1



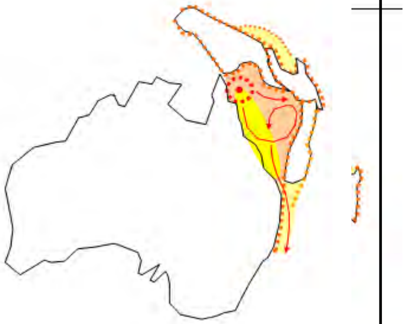
Impact Chronology of Cape York Impact

→ yellow – main ejecta area ;
→ green – ejecta rays
→ orange – magma flow areas
(dark orange → thicker or more compressed magma flows,
light orange → thinner or less compressed magma flows)

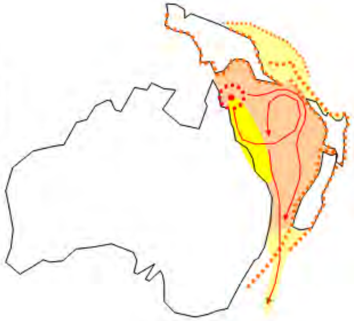
→ Find further information and images of rock samples & sample sites under : www.permiantriassic.at or www.permiantriassic.de


Ejecta Rays 1
Ejecta Rays 2
Ejecta Rays 3
Ejecta Rays 4
prepared by
Harry K Hahn
Interesting should be a material analysis of this thick and straight ejecta ray !!
Cone shaped Ejecta Ray System visible !

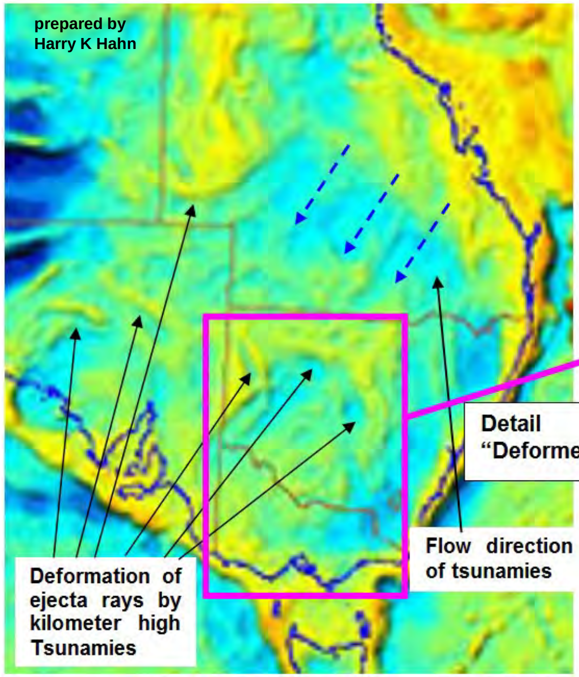
2

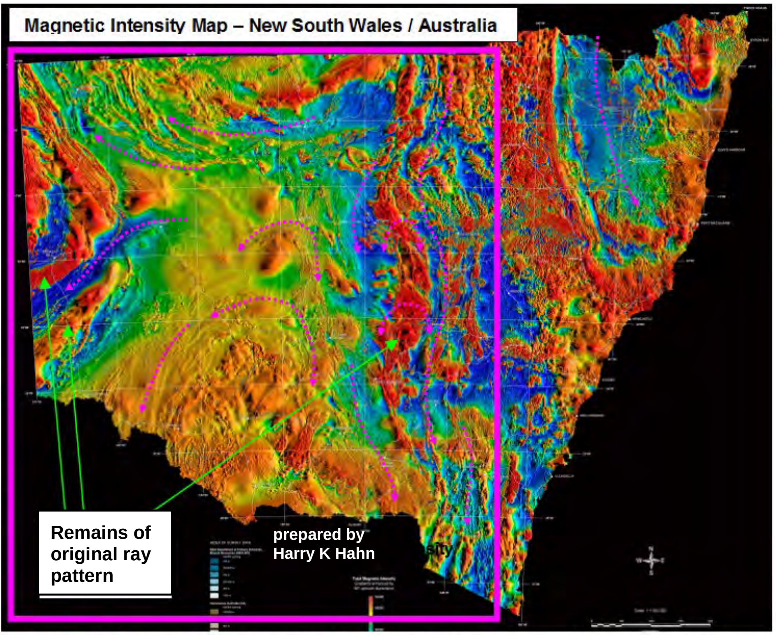


3



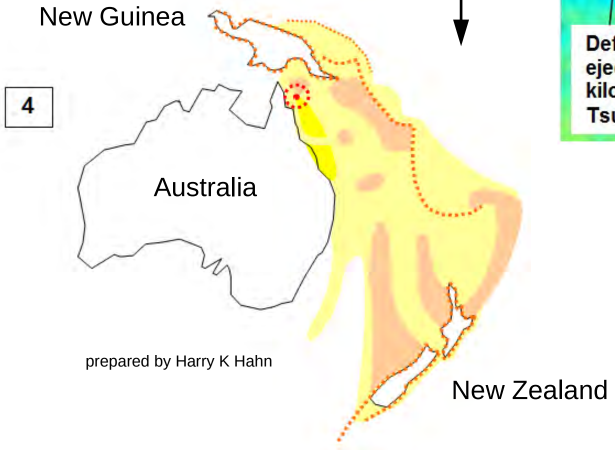
Possible Deformation of Ejecta Rays by Tsunami Waves
→ probably caused by the collapse of a magma enclosure


prepared by
Harry K Hahn
Detail
"Deformed Ejecta Rays"
Flow direction of tsunamies
Deformation of ejecta rays by kilometer high Tsunamies


Magnetic Intensity Map – New South Wales / Australia
Remains of original ray pattern
prepared by
Harry K Hahn

The Magnetic Intensity Map of New South Wales clearly shows that the surface of the whole state was altered by one gigantic flood event. The distribution of all magnetic material, which probably came from the same Impact Event, and which originally had a precise ray-like distribution pattern, was defined by this flood event.

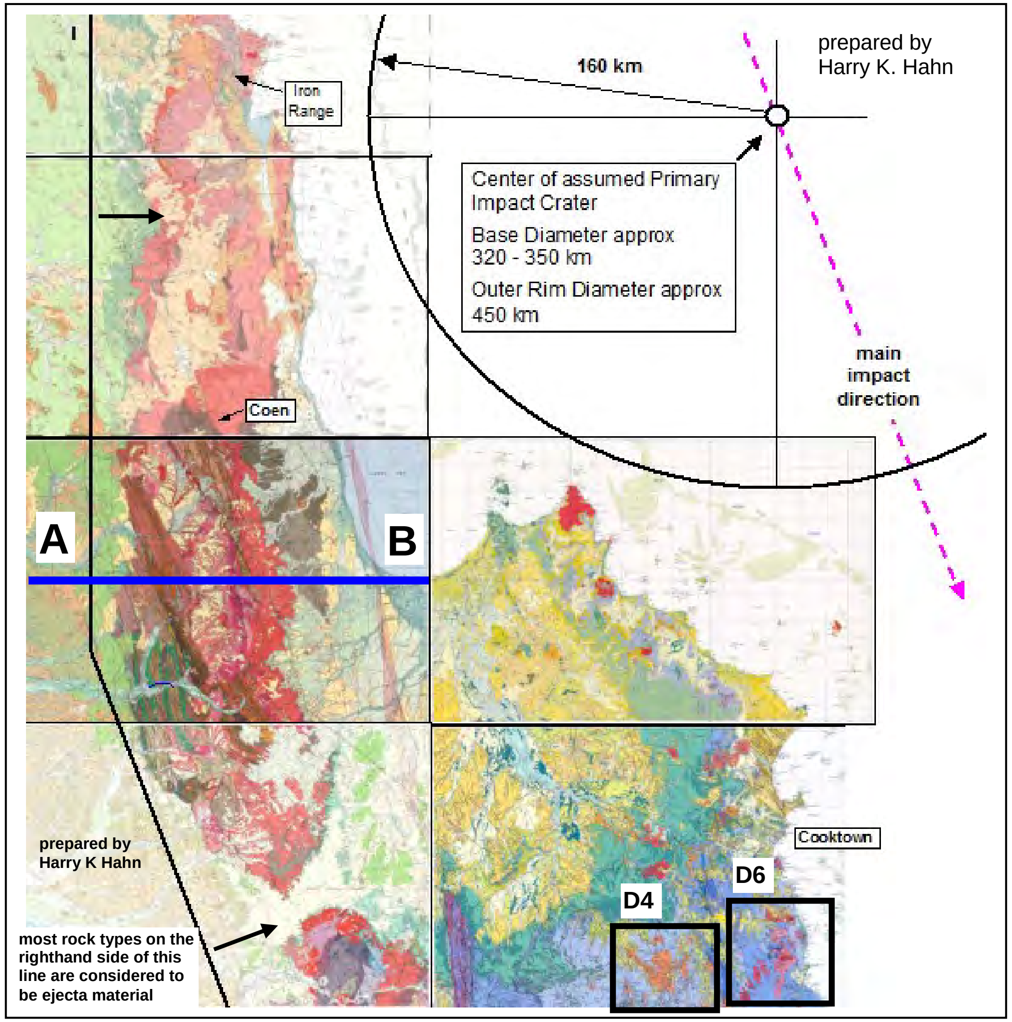
4



It seems that directly after the impact, ejecta rays were thrown out of the impact crater in the main ejecta area in precise straigth lines. Then in Phase 3 of the assumed Impact Chronology, when the crust fragments (now called New Zealand) broke free and the enclosed "magma ocean" spread out quickly over the "Pacific Plate", gigantic amounts of ocean water flew back into the collapsed "magma enclosure" because its floor was at a lower level than the sea level of the pacific ocean

This probably caused gigantic Tsunamies which flew in the indicated direction over the Australian Continent (see above). These Tsunamies probably reached heights of several hundred meters and they were strong enough to deform (bend) the thrown-out ejecta rays (→ which didn't have a rigid connection to the bed rock), as visible in the above shown maps.

Geological map showing the position of the Cape York Crater and part of the Cape York Peninsula & Cooktown area



Center of assumed Primary Impact Crater

Base Diameter approx 320 - 350 km

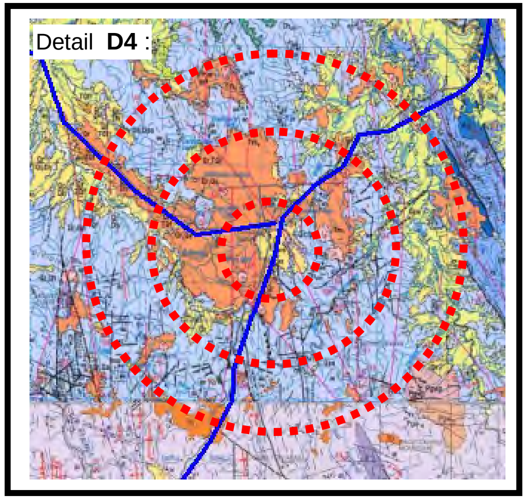
Outer Rim Diameter approx 450 km

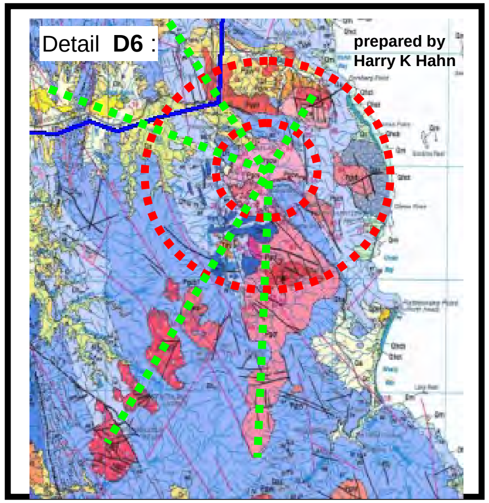
most rock types on the righthand side of this line are considered to be ejecta material

The map on the left is a map-combination of 6 geological maps, which shows the area south & west of the Cape York Impact Crater

Weblink to the geological Maps : → **Geological Maps**

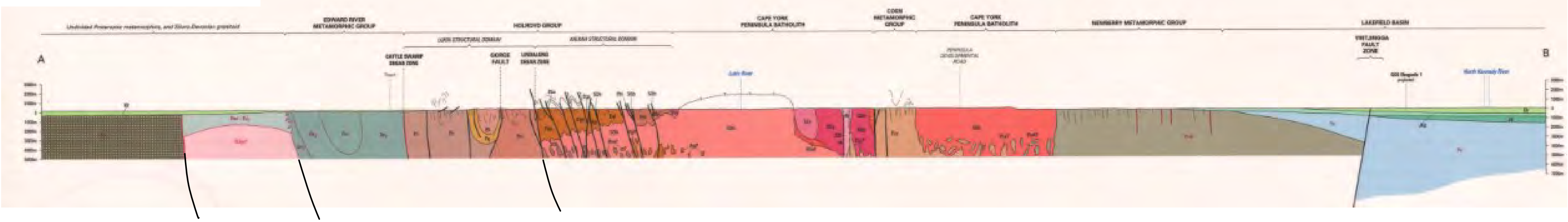
Note the indicated **ejecta-like distribution-pattern** of different rock types in **Details D4 & D6** (→ patterns indicate secondary impact structures !)





Section A – B going through the assumed impact-effected area, indicates that an extremely large impact event has taken place.

Section A – B :

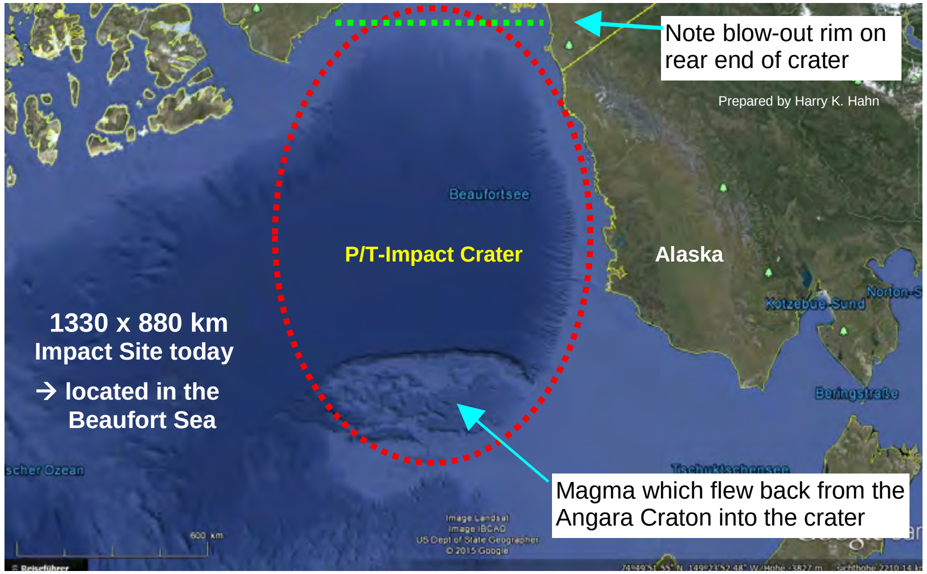


2

253 Million years ago a large asteroid collided with our planet and caused a 1330 x 880 km elliptical impact crater

The asteroid had a diameter in the range of 60 to 150 km , and it caused the most severe impact event and mass extinction known in Earth history. It is the cause of the Permian-Triassic boundary[1] , which is associated with the most extensive mass extinction of marine species and terrestrial vertebrates and plants. And it caused the single largest eruption of "continental" flood lavas, the Siberian Traps

The following images and explanations describe the impact event and its effects on our planet Earth during the ~ 253 million years from this event. As everyone can can imagine, this powerful impact event completely reshaped Earths appearance !



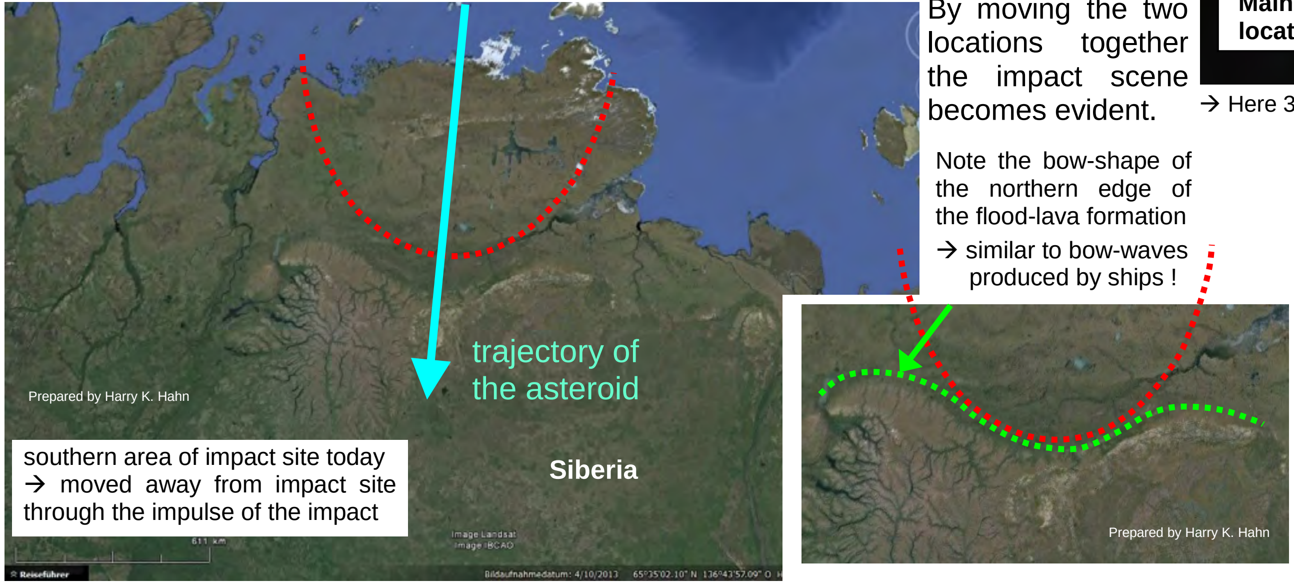
Note blow-out rim on rear end of crater

1330 x 880 km Impact Site today

→ located in the Beaufort Sea

Magma which flew back from the Angara Craton into the crater

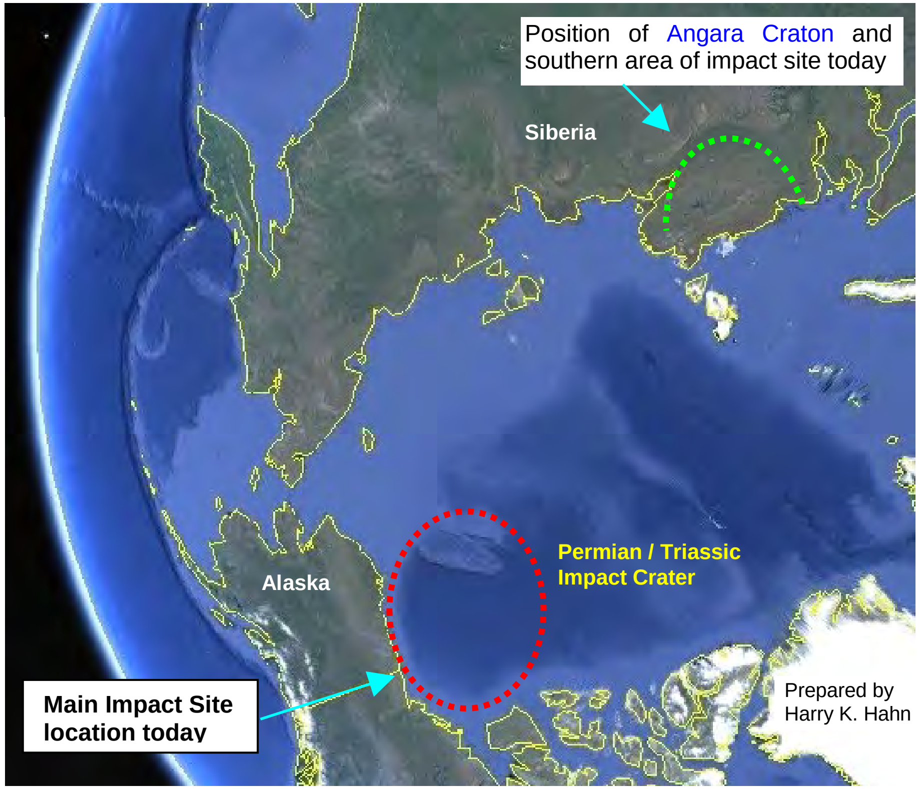
The two images on the left show the remains of the impact site as it appears today. The main impact site is located in the Beaufort Sea close to the coast of Alaska. Another part of the impact crater which moved away from the impact site through the impulse of the impacting asteroid is located in Siberia By moving the two locations together the impact scene becomes evident.


trajectory of the asteroid
Siberia
Prepared by Harry K. Hahn
Prepared by Harry K. Hahn
611 km
Image Landsat
Image IBCAO
Reiseführer

southern area of impact site today → moved away from impact site through the impulse of the impact

Note the bow-shape of the northern edge of the flood-lava formation

→ similar to bow-waves produced by ships !

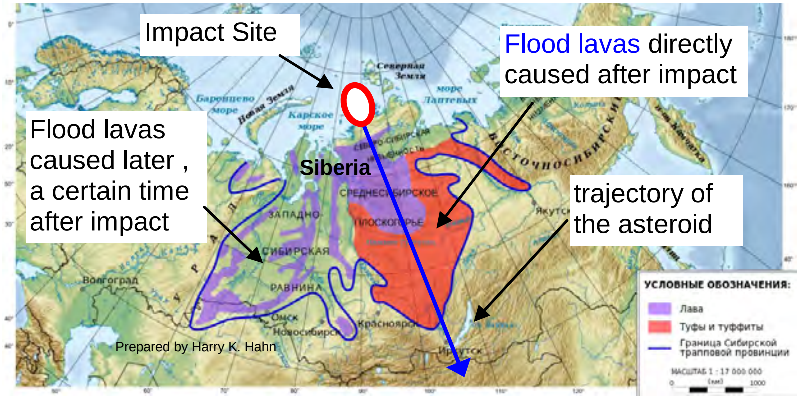


Position of Angara Craton and southern area of impact site today

Main Impact Site location today

→ Here 3 informative **movies about the P/T-Event** : PT_Movie 1 ; PT_Movie 2 ; PT_Movie 3

The flood lavas caused by the impact : The Siberian Traps



Impact Site

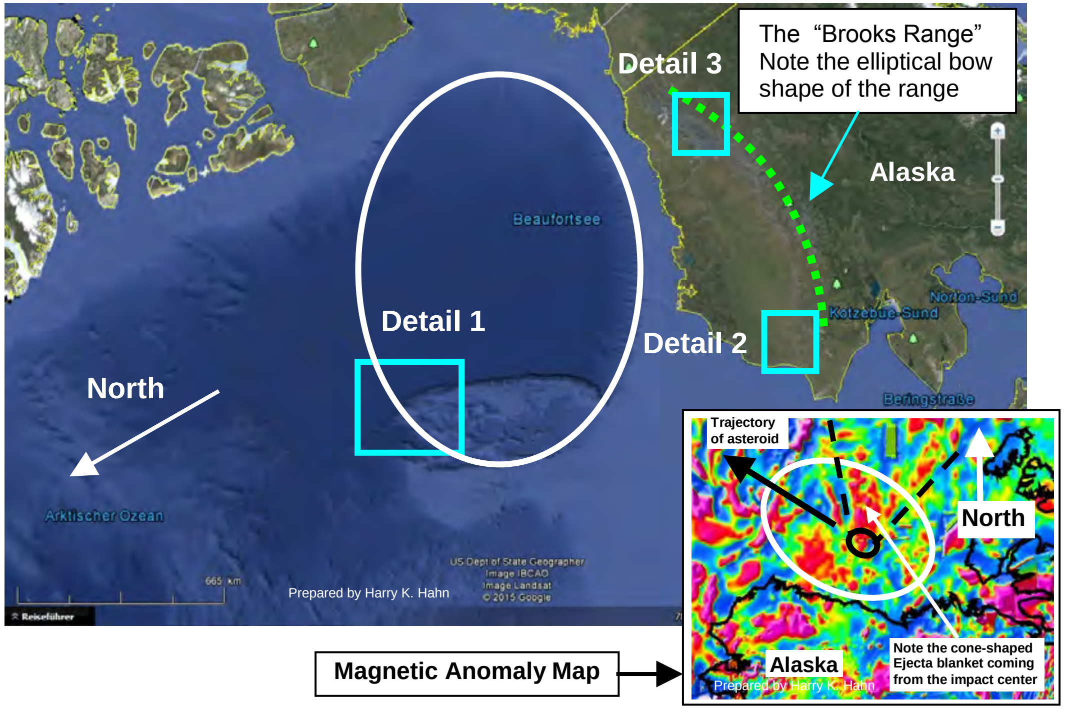
Flood lavas directly caused after impact

Flood lavas caused later , a certain time after impact

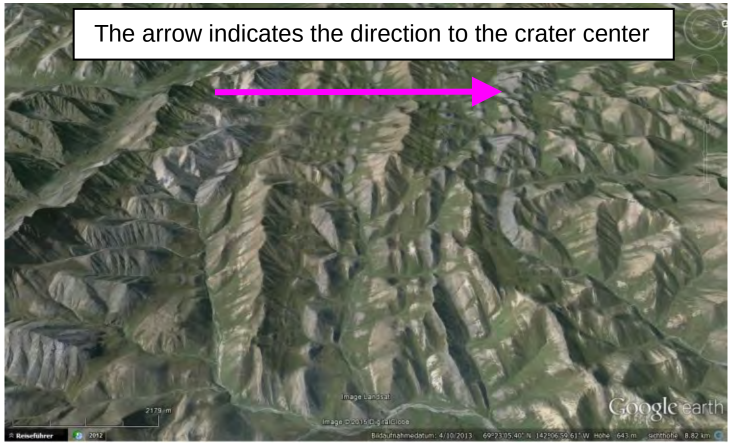
trajectory of the asteroid

Some geological formations caused by the 1330 x 880 km PT – Impact (→ the Permian-Triassic-Impact)

When the asteroid impacted it produced extreme shockwaves which ran trough Earth's crust and mantle. In close proximity to the impact site the shockwaves formed the Brooks Range. The Brooks Range has an elliptical bow-shape which fits to the elliptical shape of the main impact crater. An age analysis of rocks from this mountain range shows strong evidence for an age of 240 to 250 Ma, for the formation of the Brooks Range. This is further evidence for the formation of a Permian Triassic[2]-Impact Crater ~250 Ma years ago. The magnetic anomaly map also indicates an impact event.

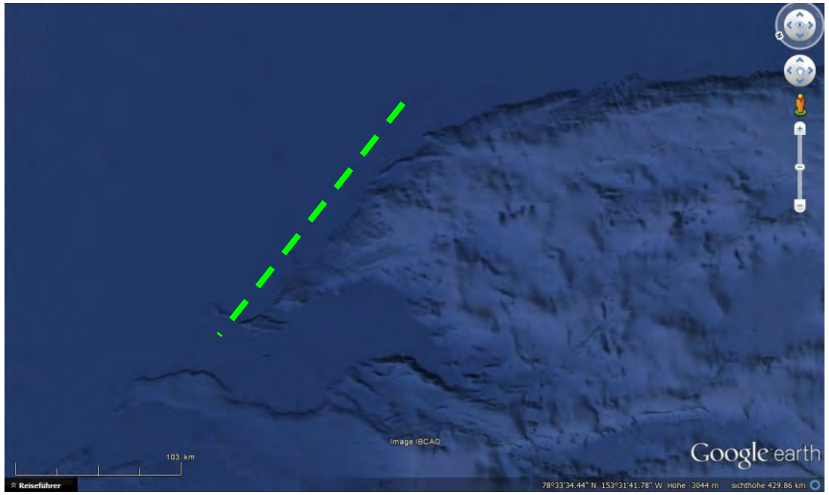

Detail 3
The "Brooks Range" Note the elliptical bow shape of the range
Alaska
Beaufortsee
Detail 1
Detail 2
North
Norton-Sund
Kotzebue-Sund
Beringstraße
Arktischer Ozean
665 km
US Dept of State Geographer
Image IBCAO
Image Landsat
© 2015 Google
Prepared by Harry K. Hahn
Magnetic Anomaly Map
Trajectory of asteroid
North
Alaska
Note the cone-shaped Ejecta blanket coming from the impact center
Prepared by Harry K. Hahn

Detail 3 : The Brooks Range formed through compression of the crust surrounding the impact crater , which was caused by the extreme shockwaves of the impact event. Note the linear structure of the mountain ridges and the rock layers which are tilted in a defined angle towards the crater center.

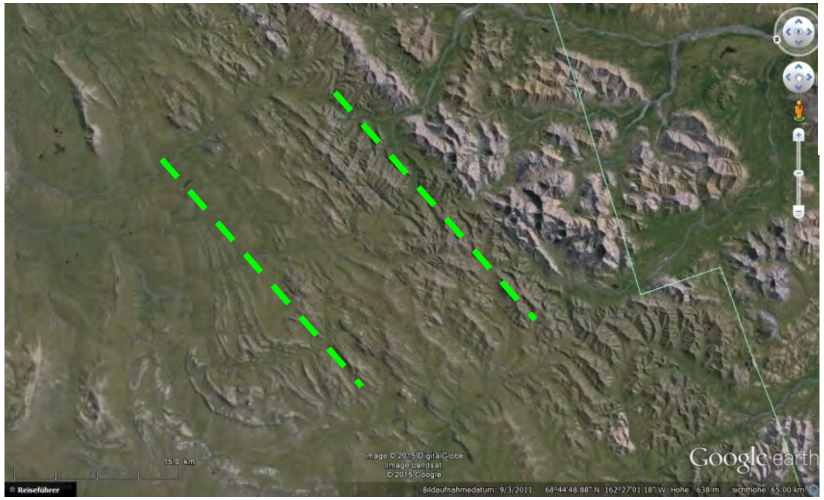


Some of the mountains of the Brook Range are covered by bizarre shaped layers of lava. Probably a result of flood lava outflow from the crater.

Detail 1 : The magma traces on the crater floor at the frontend of the crater indicate the angle of the escaping ejecta



Detail 2 : This section of the Brooks Range also indicates the escape angle of the ejecta. It's similar (but opposite) to Detail 1



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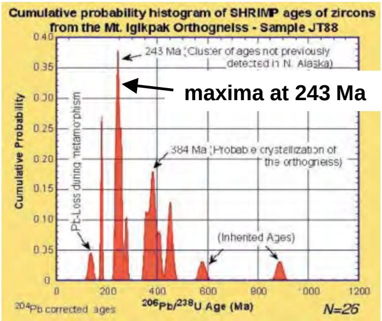
see : Zircon Analysis of Rocks from the Brooks Range (from Jaime Toro, Dep. Geology, WV) : With SHRIMP-RG analyzed rims and cores of 15 zircon crystals indicate 206Pb/238U ages range from 137 to 887 Ma with **histogram maximas at 243 & 384 Ma.**



To the evolution of the PT – Impact Event, and the effects of the impact on Earth's crust

The PT$_3$-Impact was an oblique impact. This means the impactor, a large asteroid or a comet, with ~ 60 to 150 km diameter, impacted on our planet in a very shallow angle. The impact angle was probably < 15°. Therefore the impact, which took place close to the north-pole, produced a large butterfly-shaped ejecta blanket, originating at the impact site and spreading over the majority of Earth's surface area. ⟶

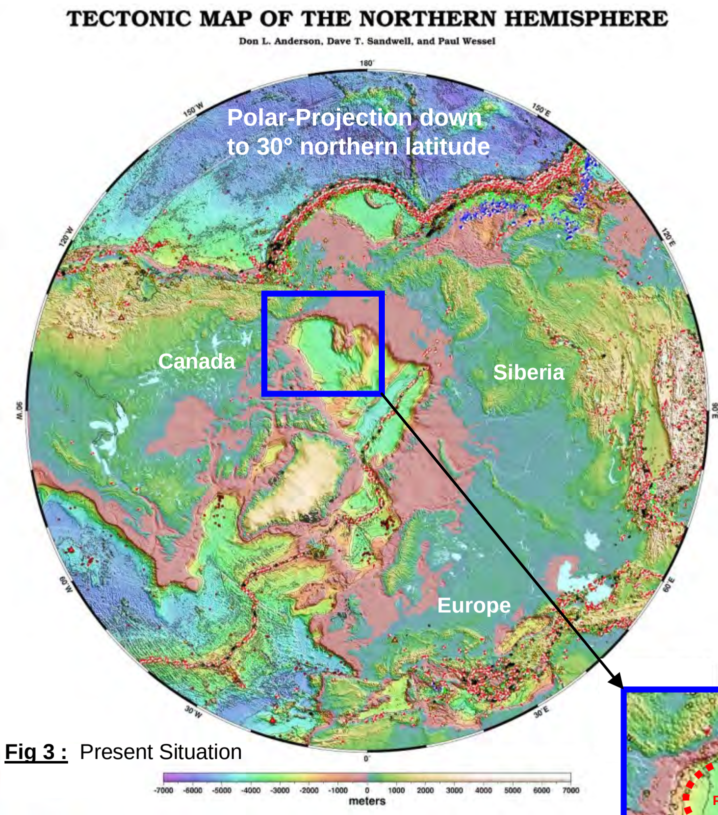
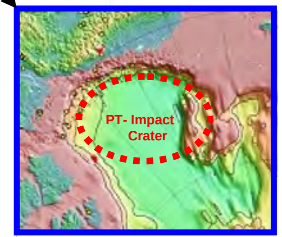


Fig 3 : Present Situation

→ The butterfly-shaped outline of the ejecta blanket (marked in red) is shown on the map in FIG. 1

The tectonic map on the left (FIG 3), a polar projection shows the present situation. The two maps on the right side show the situation directly at the time of the PT-Impact, and at ~ 150 Ma after the PT-impact.

Because of the immense size of the impactor, the ejecta blanket which resulted from the impact, covered nearly Earth's complete surface, and it produced very large secondary impacts. Most of these secondary impacts were distributed within this butterfly-shaped ejecta pattern, and many secondary impact craters formed along distinct ejecta rays (e.g. ejecta rays R1 to R4), which have their starting point at the PT-Impact Crater.



Detail of Impact Site

Fig 1 : A Polar-Projection centred on the PT-Impact Site (→ center point corresponds approx. to the North-Pole too). The map shows Earth's complete surface area and the positions of Earth's continents as they probably were located at the time of impact. The area which was most effected by the PT-Impact is located within the butterfly-shaped ejecta blanket (red) Most secondary impacts (marked in pink & orange) and ejecta rays are also located within this area.

Fig 2 : A Polar-Projection of the North-Pole area down to approx. 30° northern latitude , showing the scene at a time between the PT-Impact and today. All following considerations in this study are based on a smaller Earth before the impact and on strong Expansion Tectonics after the impact, because all maps used for the analysis indicate Expansion Tectonics !!

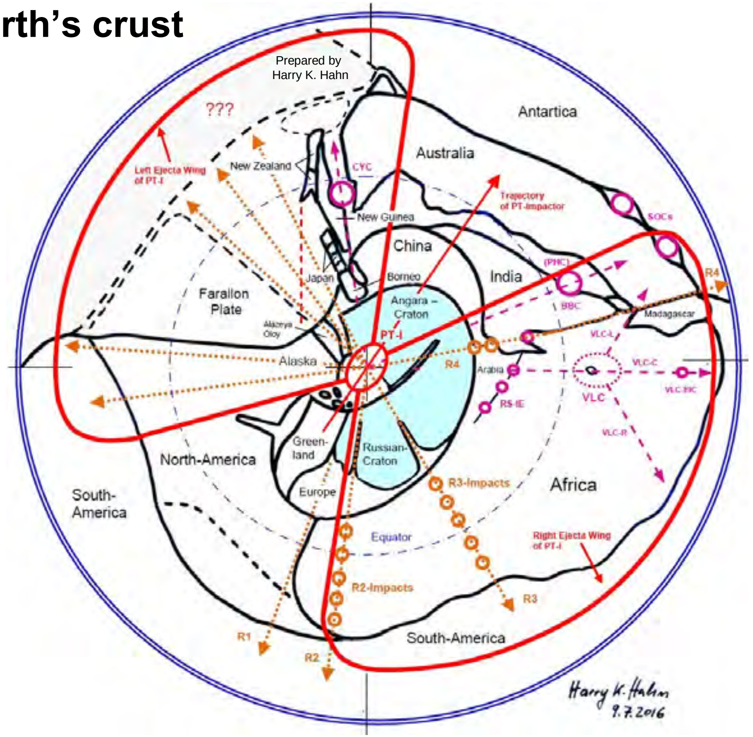


Fig 1 : Polar-Projection of Earth's complete surface area at the time of Impact centred on the PT-Impact Crater. **Earth diameter : ~6500-7500 km**

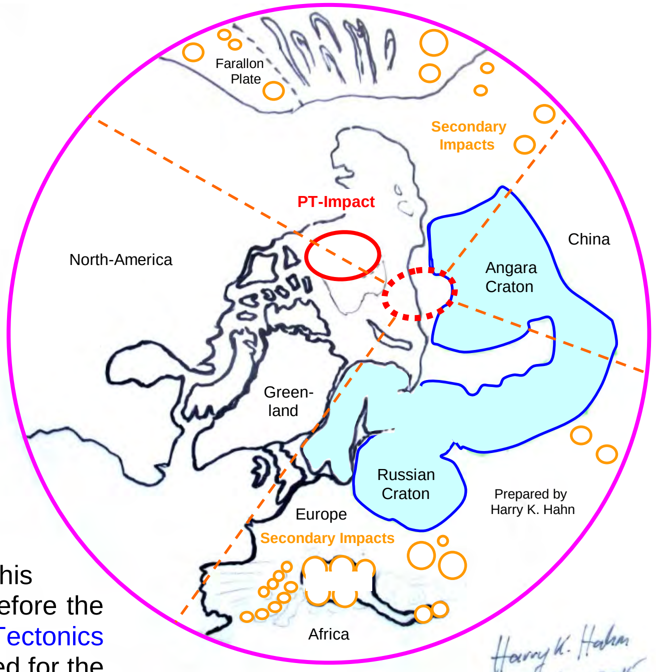


Fig 2 : Polar-Projection down to 30° N ~100 Ma ago, Ø Earth : ~ 10000 km

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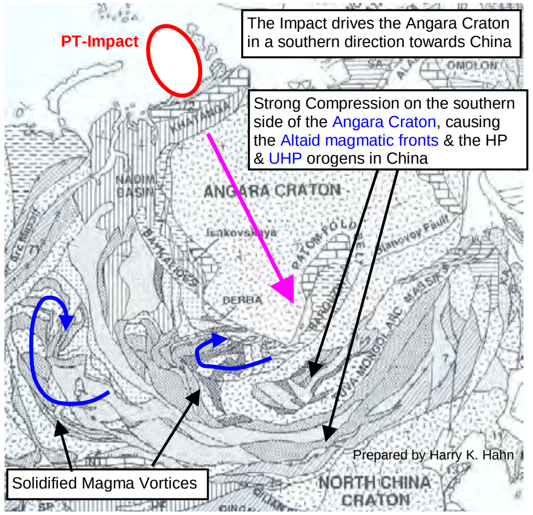
19.9.2015



The Impact drives the Angara Craton in a southern direction towards China

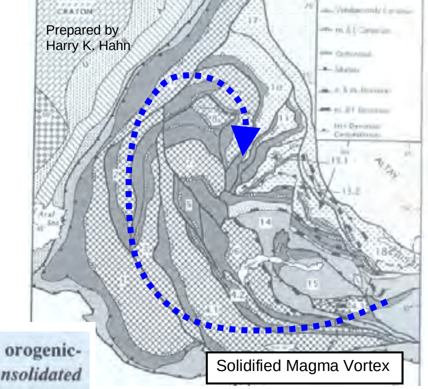
Strong Compression on the southern side of the Angara Craton, causing the Altaid magmatic fronts & the HP & UHP orogens in China

Solidified Magma Vortices

Prepared by Harry K. Hahn

Figure 21.6. Paleotectonic map of Asia showing the primary orogenic-collage components mentioned in the text. *Precambrian consolidated*

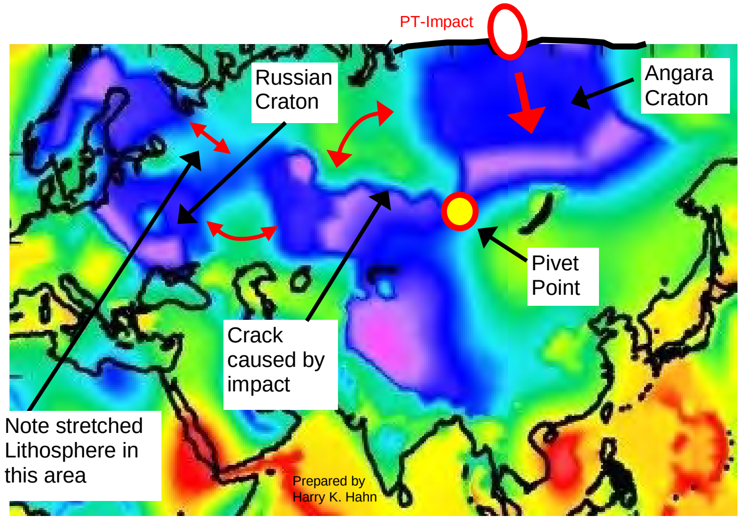
From the book : **"The Tectonic Evolution of Asia"**, from An Yin & Mark Harrison



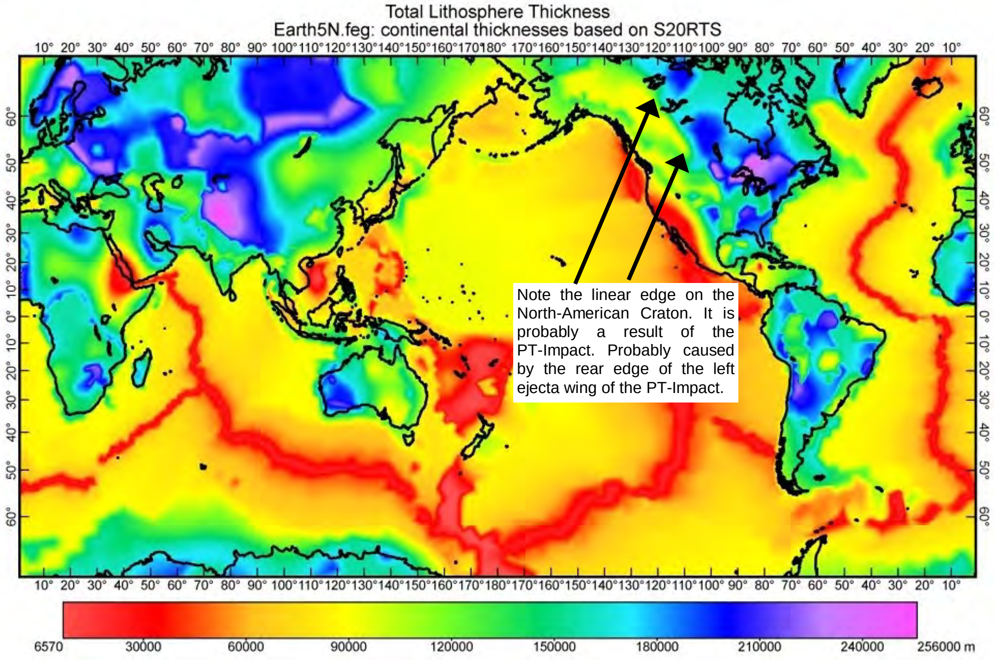
The tectonic evolution after the PT – Impact Event

Prepared by Harry K. Hahn

As already mentioned on the previous page, all the following considerations are based on a smaller Earth with ~Ø 6500-7500 km before the impact, and on strong Expansion Tectonics after the impact. Because all maps used for the analysis indicate that the PT_2-Impact triggered strong Expansion tectonics on Earth which is probably still going on today. (→ There is certainly much more expansion than subduction going on even today !)



Model of total lithosphere thickness. A composite of continental thicknesses scaled from vertical-S-wave upper-mantle travel-time-anomalies and an age-dependent model in the ocean basins.
See following Weblink : http://peterbird.name/publications/2008_torque_balances/012_total_lithosphere-Earth5N.jpg



Note the linear edge on the North-American Craton. It is probably a result of the PT-Impact. Probably caused by the rear edge of the left ejecta wing of the PT-Impact.

An important key-map for the analysis :

On the lefthand side a composite of continental thicknesses scaled from vertical-S-wave upper-mantle travel-time-anomalies combined with an age-dependent model of ocean basins is shown.

The map shows that there was originally a complete Eurasian Craton. However this large Eurasian Craton was hit by the asteroid ~253 Ma ago and broke apart through the immense shear- & bending stress which was induced into the Craton by the Impact Impulse.

The physical description of the impact event :

The PT_3-Impact event can roughly be divided into three phases which I will describe in the following :

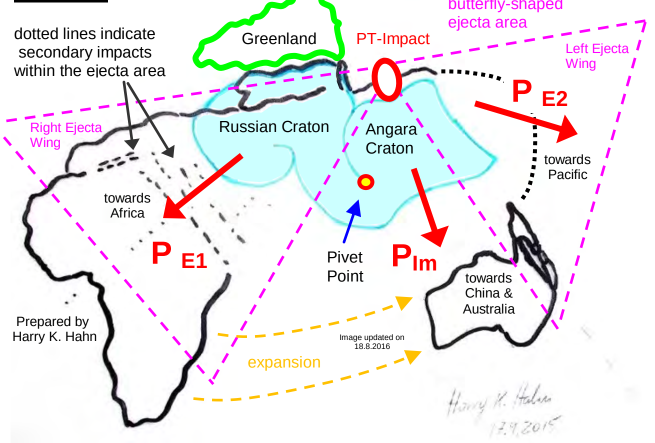
Phase 1 : The impact produced three main impulses which were induced into the surrounding Lithosphere. The impulse P_{IM} from the Impactor itself and the two Ejecta-Impulses P_{E1} and P_{E2} which all accelerated different areas of Eart's crust (lithosphere). The following formula can be applied :

$$\boxed{P_{Total} = P_{IM} + P_{E1} + P_{E2}}$$

Phase 2 : The accelerated sections of Earth's Crust (e.g. the Angara & Russian Cratons, which rotated around a common pivot point) then later produced immense compression stress further away, where they collided with other thick crust areas.

Phase 3 : The further tectonics is more complex , because of complex interaction between different areas of Earth's crust. The begin of phase 3 is roughly described in the image on the right-hand side.

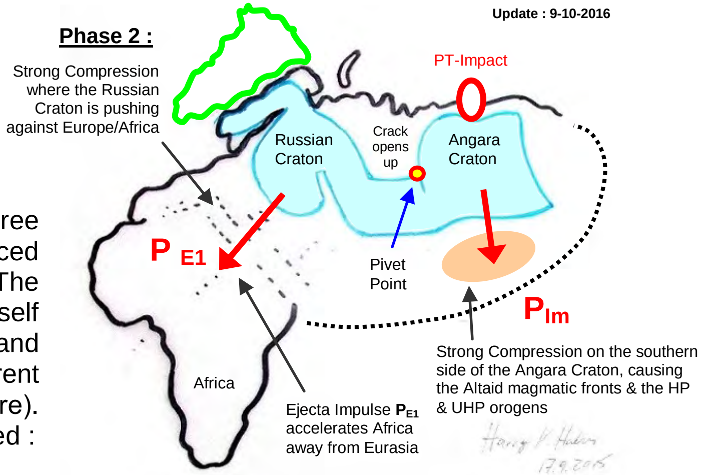
Phase 1 :



dotted lines indicate secondary impacts within the ejecta area

Update : 9-10-2016

Phase 2 :

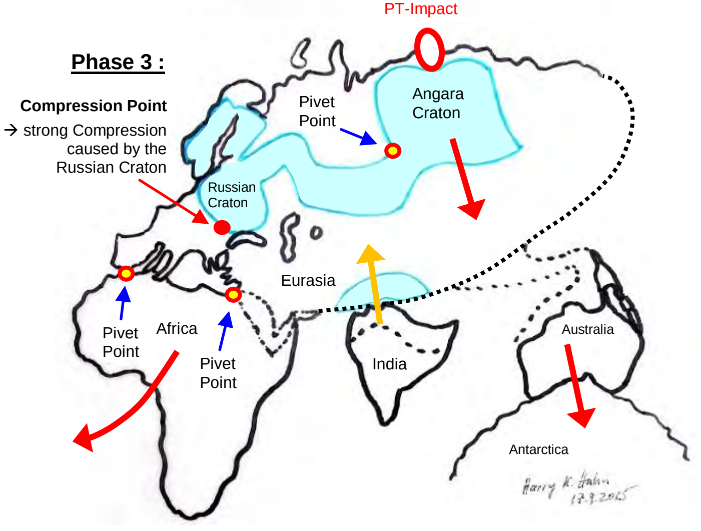


Strong Compression where the Russian Craton is pushing against Europe/Africa

Ejecta Impulse P_{E1} accelerates Africa away from Eurasia

Strong Compression on the southern side of the Angara Craton, causing the Altaid magmatic fronts & the HP & UHP orogens

Phase 3 :



Compression Point
→ strong Compression caused by the Russian Craton

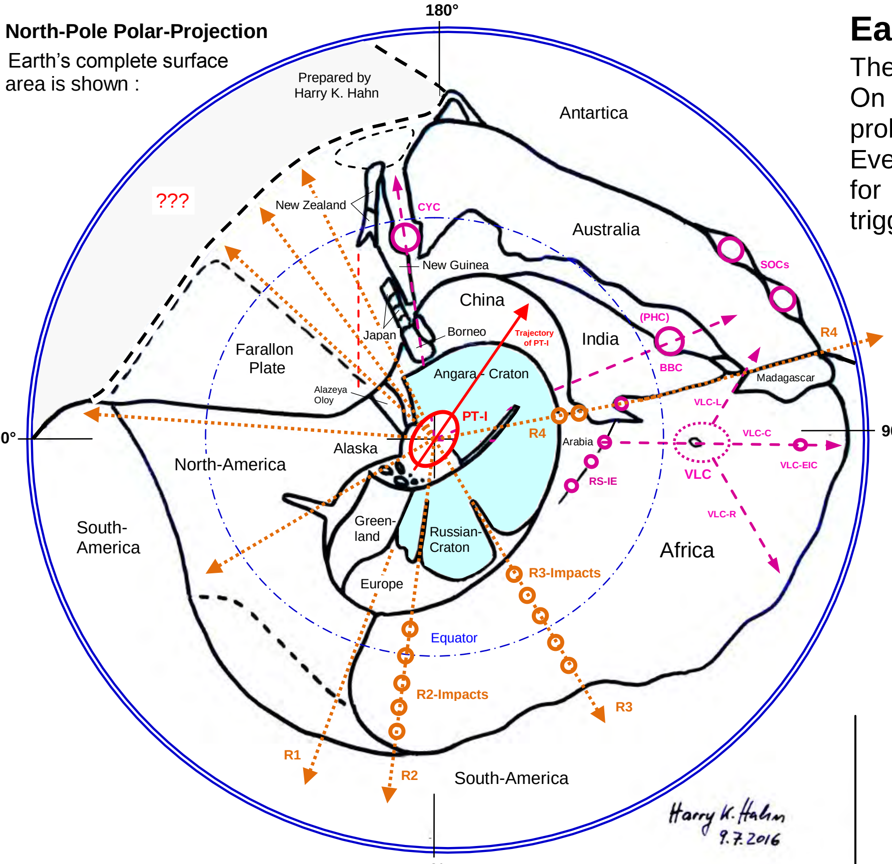
Earth at the time of the PT-Impact Event

Prepared by Harry K. Hahn

The following maps show how our planet Earth probably looked at the time of the Permian-Triassic (PT)-Impact On these maps, the arrangement of Earth's continents at PTI-time is based on impact structures which in all probability were caused by the PT-Impact Event (especially the CYC-, the BBC/PHC- and the VLC-Impact Event & the Ejecta Rays (crater chains) R1-R4 were used as a reference). And an Expansion Tectonics model for Earth was used as base for these maps. The PT-Impact Event caused the shown fracture pattern, which triggered an expansion tectonics process on Earth. → **Earth's Ø** at the time of the PT-Impact : **~6500-7500 km**

North-Pole Polar-Projection

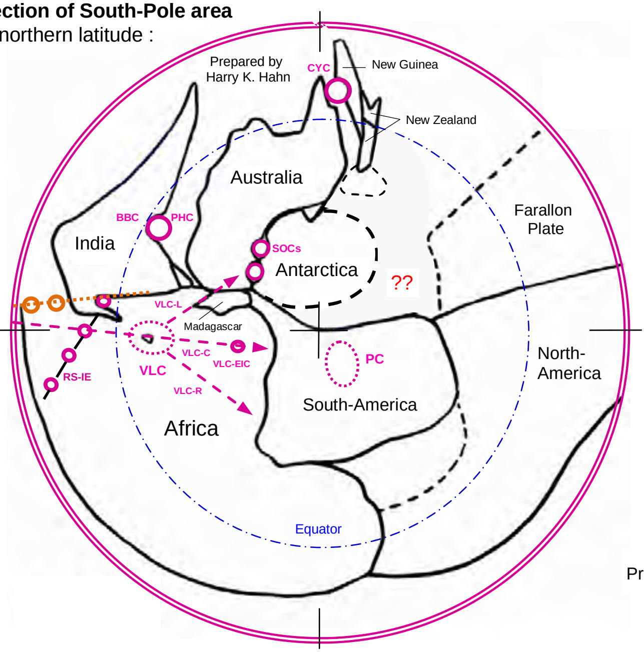
Earth's complete surface area is shown :



Harry K. Hahn
9.7.2016

Polar-Projection of South-Pole area

up to ~ 45° northern latitude :



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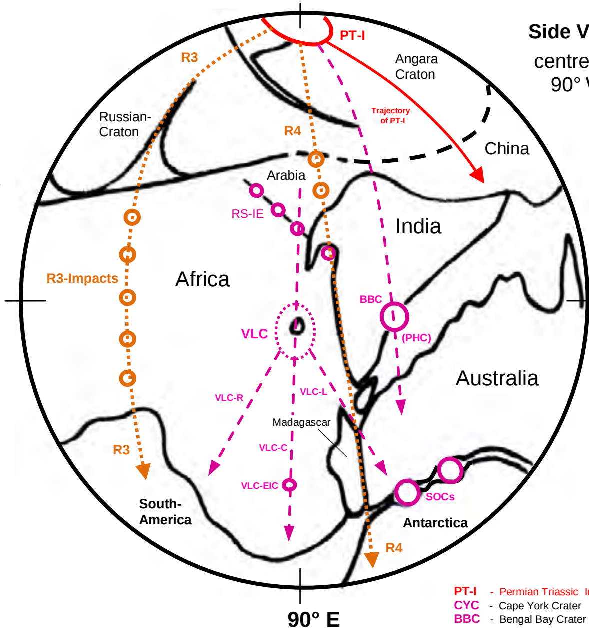
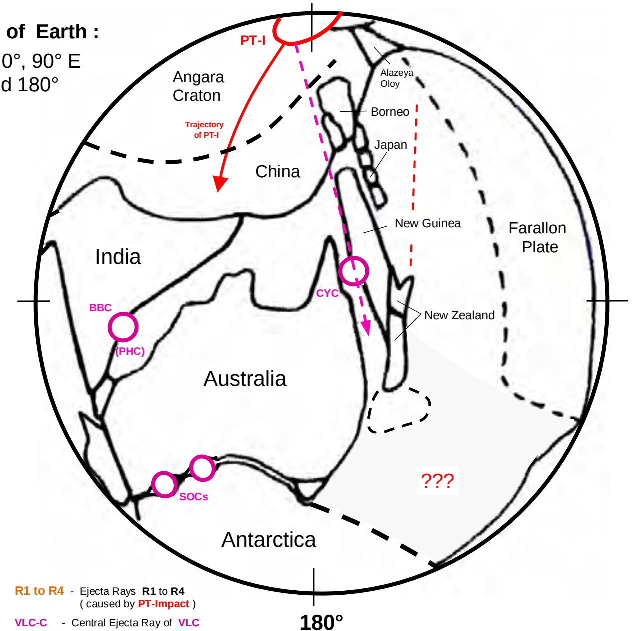
Update : 9-10-2016

Side Views of Earth :

centred on 0°, 90° E
90° W and 180°





PT-I - Permian Triassic Impact		**R1 to R4**	- Ejecta Rays **R1** to **R4** (caused by **PT-Impact**)
CYC - Cape York Crater			
BBC - Bengal Bay Crater		**VLC-C**	- Central Ejecta Ray of **VLC**
(PHC) - (Port Hedland Crater)		**VLC-R**	- Right Ejecta Ray
SOCs - Southern Ocean Craters		**VLC-L**	- Left Ejecta Ray
VLC - Victoria Lake Crater		**VLC-EIC**	- Ejecta Impact Crater of **VLC**
PC - Pantanal Crater		**RS - IE**	- Red Sea Impact Event

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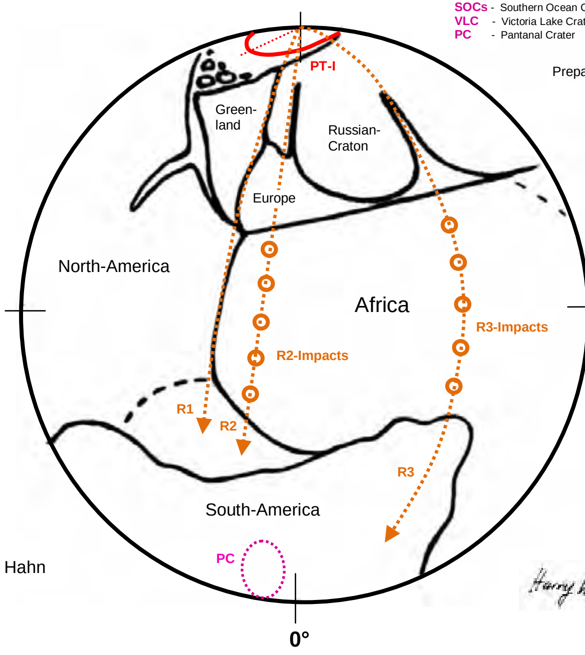
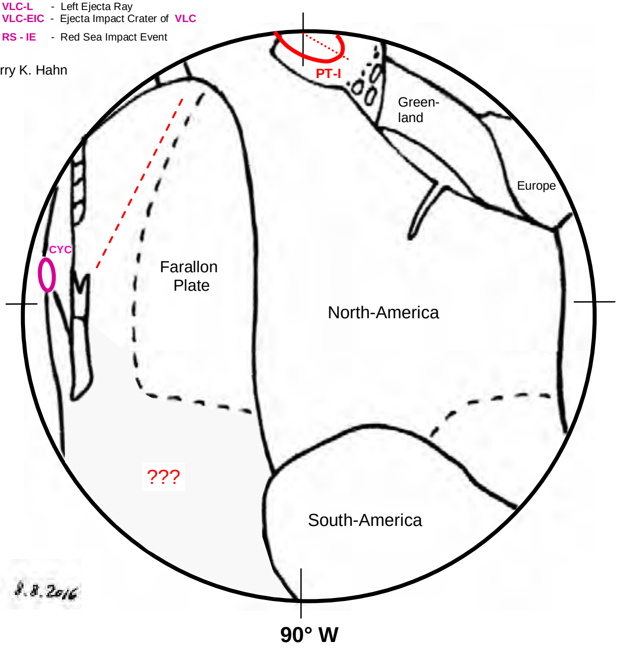




Harry K. Hahn 8.8.2016

The evolution of the Pacific Plate & the Pacific Ocean

Prepared by Harry K. Hahn

The evolution (or better the creation) of the Pacific Plate and the Pacific Ocean is closely related to the **PT**-Impact Event. Planet Earth was considerably smaller before the Permian Triassic$_2$ **Impact** (→ around 6500 – 7500 km in diameter), and the hypothetical Panthallasian Ocean never existed in the extension mentioned in geological literature ! To cut a long story short :

→ "The creation of the Pacific Plate & the Pacific Ocean was triggered by the PT-Impact Event !"

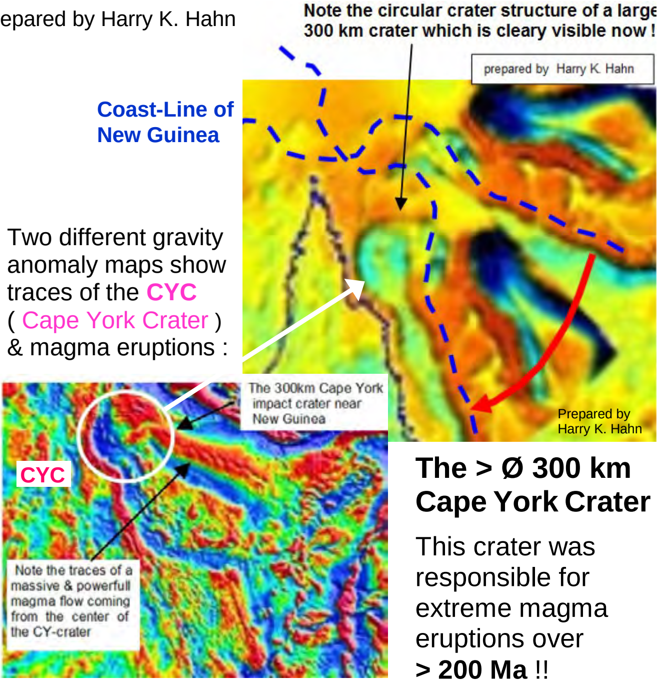
"Earth's dichotomy, and the creation of all major oceans on Earth, including the sea water contained in these oceans, is a longterm result of the Permian-Triassic (PT$_3$)-Impact ! "

The large secondary impact crater CYC (Ø 300 km), near Cape York peninsula in NE-Australia (→ caused by the PT-Impact), **also played a major role in the evolution of the Pacific Plate.** ⟶

And the traces produced by the Cape York impact crater (**CYC**) , especially the later gigantic magma eruptions originating from this impact crater, can be used as evidence to confirm this statement !

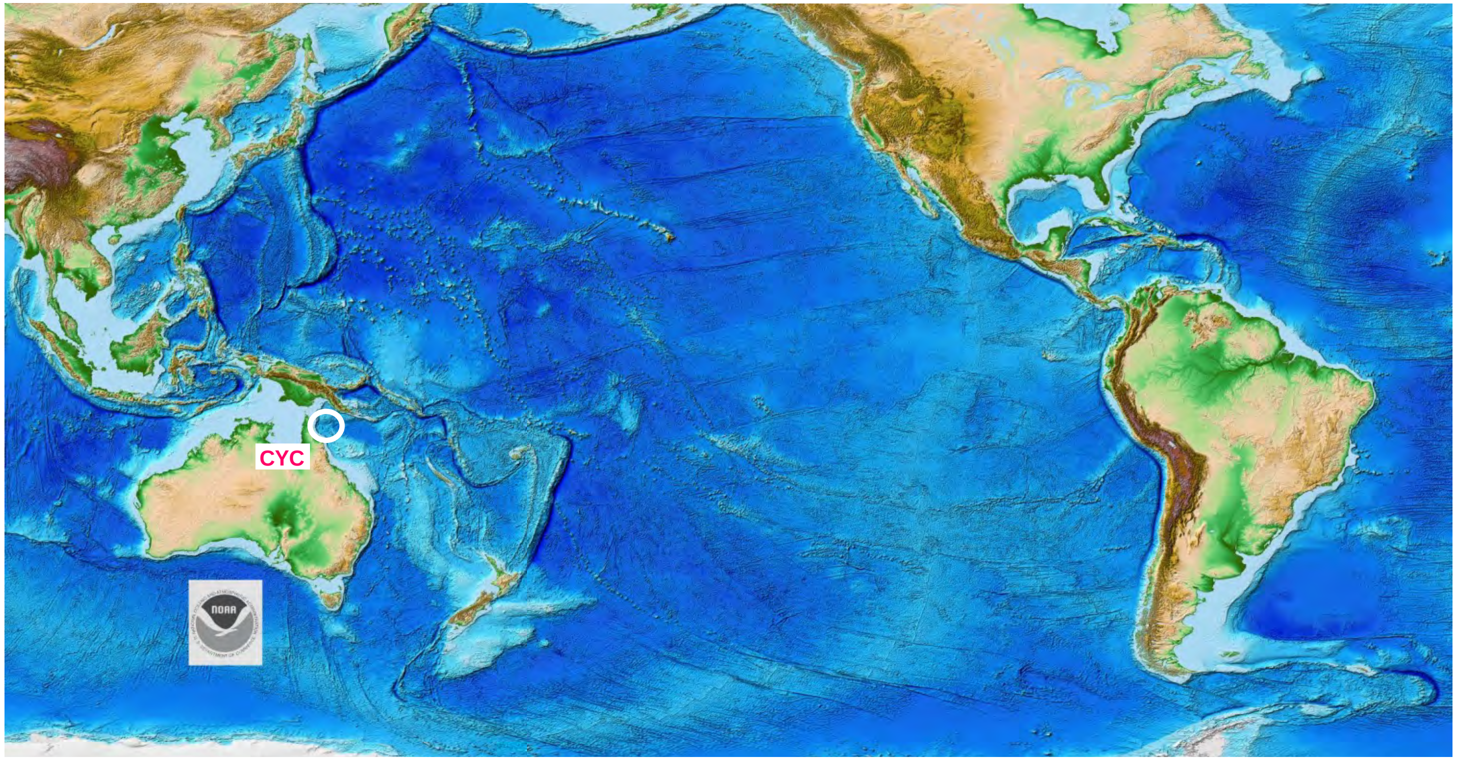
In the following I want to show and explain some key-areas of the pacific ocean floor which contain the hard evidence to confirm these statements :

Two different gravity anomaly maps show traces of the **CYC** (Cape York Crater) & magma eruptions :


Note the circular crater structure of a large 300 km crater which is cleary visible now !
prepared by Harry K. Hahn
Coast-Line of New Guinea
Prepared by Harry K. Hahn
The 300km Cape York impact crater near New Guinea
CYC
Note the traces of a massive & powerfull magma flow coming from the center of the CY-crater

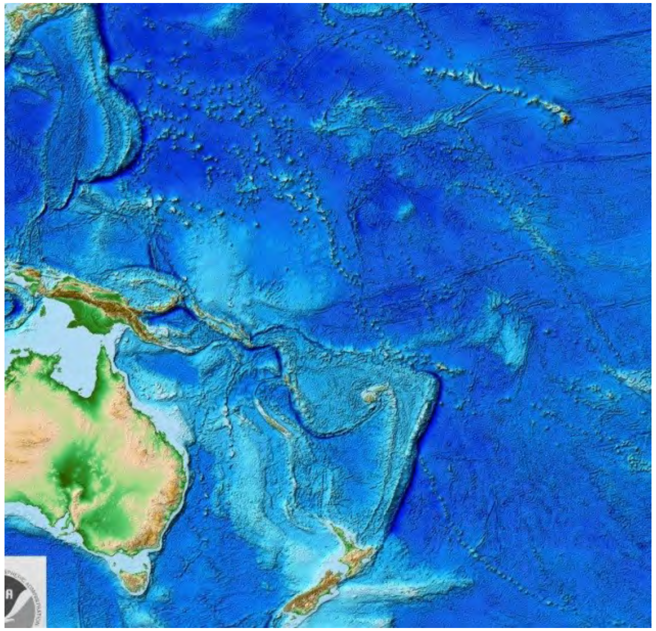
The > Ø 300 km Cape York Crater

This crater was responsible for extreme magma eruptions over **> 200 Ma** !!



This map from NOAA is an important key-map to understand the tectonic evolution of the Pacific Plate !

It contains all the traces which are required for a precise analysis of the evolution of the Pacific Plate !

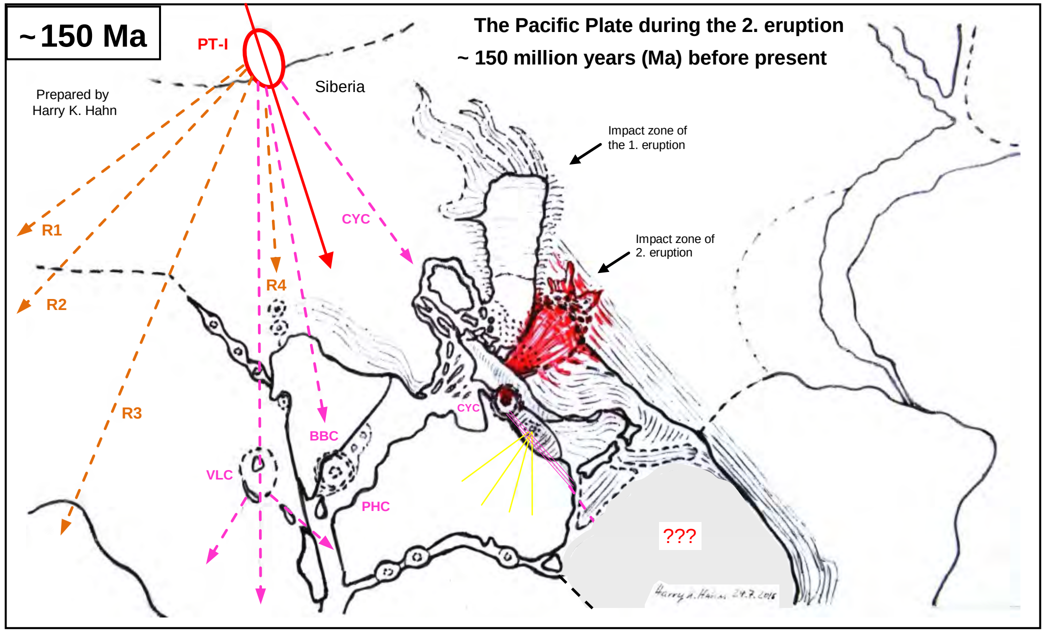


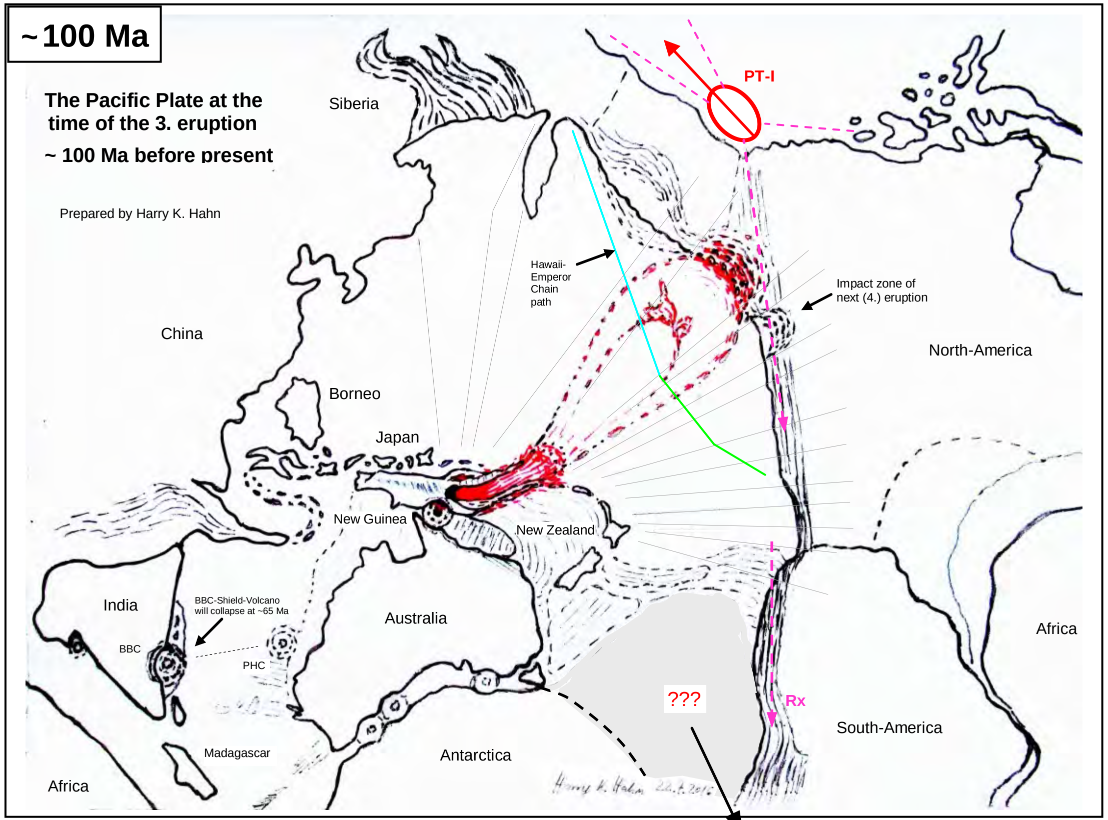
→ And this is the key-area which must be analysed in much more detail than my preliminary analysis !

It will describe the interdependencies of certain areas of the "Pacific Plate" and their evolution with high precision !

The evolution of the Pacific Plate & Pacific Ocean, in the aftermath of the PT-Impact Event :

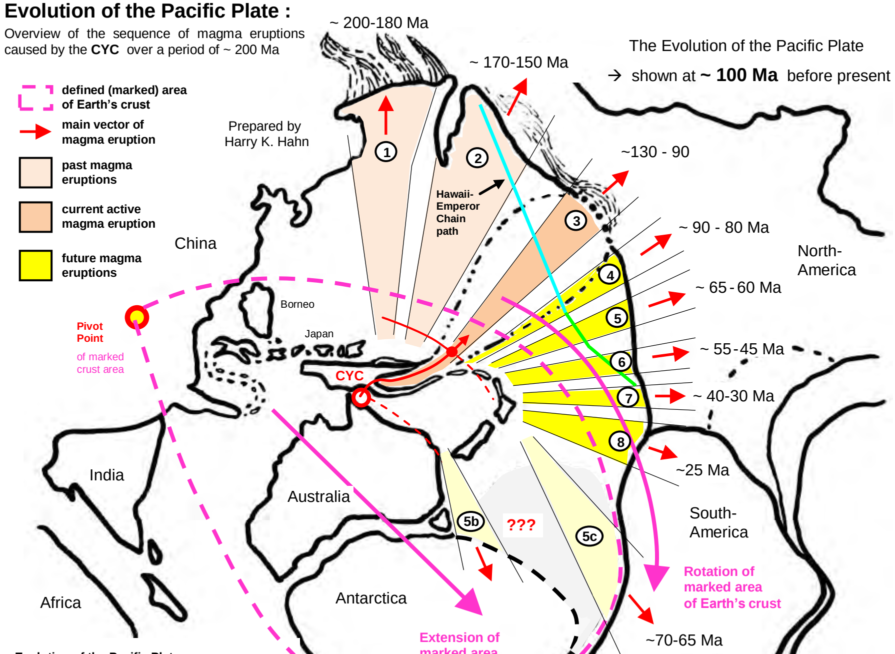
The Impact impulse of the **PT-Impact Event** caused an acceleration of Australia & Antarctica towards SE. Together with many fractures in Earth's crust, caused by very large secondary impacts (e.g. by BBC, CYC & VLC), and together with powerful temporary magma eruptions of the Cape York Crater, the dynamic process of this evolution began.





Evolution of the Pacific Plate :

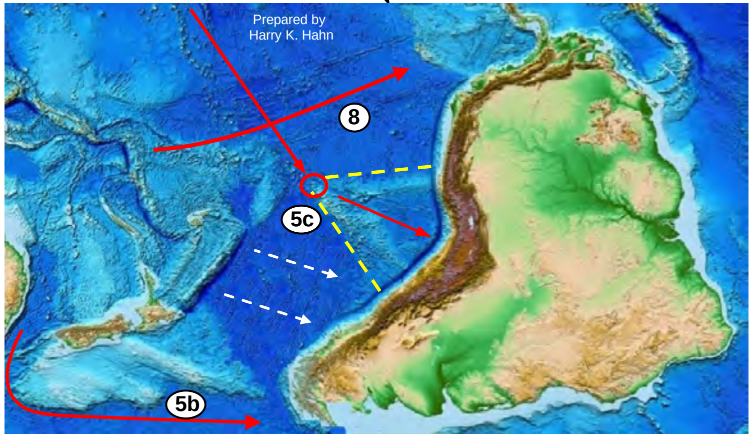
Overview of the sequence of magma eruptions caused by the **CYC** over a period of ~ 200 Ma



Evolution of the Pacific Plate :

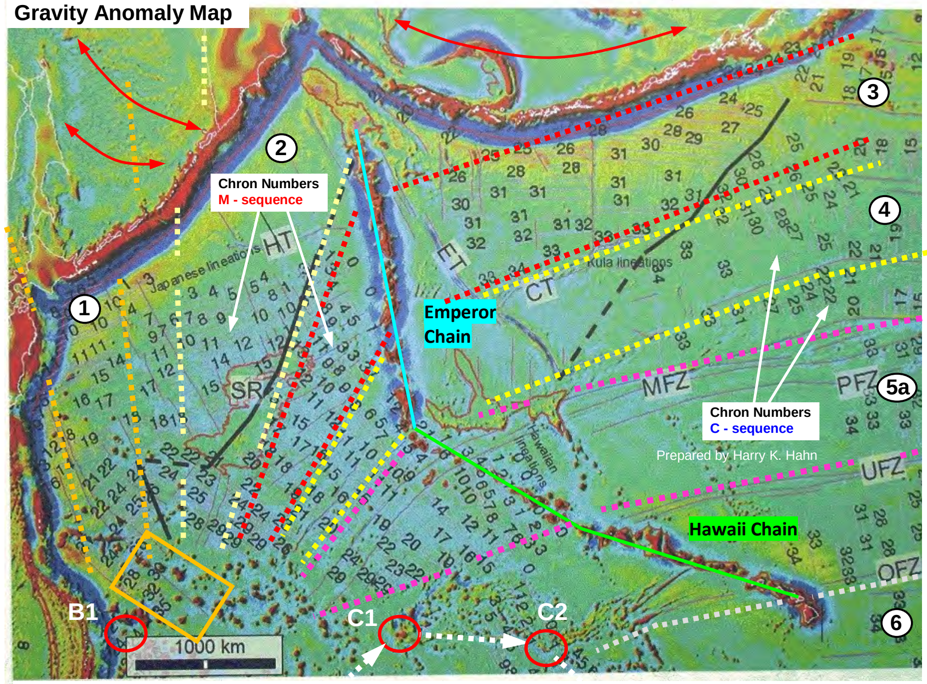
→ caused by the extension and the rotation of a large area of Earth's crust, caused by a number of violent magma eruptions originating from the Cape York Crater (CYC). The marked area was initially accelerated by the impulse of the PT-I

To the Evolution of the Pacific Plate



The Pacific Plate (→ new ocean floor !) was caused by an Expansion Tectonics process. This expansion tectonics process was triggered by the Permian-Triassic Impact Event (PT-I), and by a number of very large magma eruptions coming from a big secondary crater, caused by the PT-I event. This impact crater is the Cape York Crater (CYC) located just east of the Cape York Peninsula in the NE of Australia. This 300-350 km diameter crater must have been caused by a particular large and dense secondary impactor, because it penetrated deep into Earths mantle and formed a channel which connected to the Pacific-LLSVP (caused by ejecta of the PTI), which produced at least 8 but maybe up to 10 extremely large magma eruptions over the last 200 Ma, which initially erupted in a north- and north-eastward direction, and later mainly in an eastward direction. The Impact Impulse of the PT-I together with the described magma eruptions of the CYC caused the expansion and rotation of a large area of Earth's crust (→ Australia, Antarctica, New-Guinea, Indonesia, Japan etc.). The eruption which happened around 65-60 Ma ago (→ which may have been triggered by the Chicxulub Impact) was a particular violent eruption. This eruption seems to have initiated the final separation of Asia, Australia, Antarctica & South-America. The expansion tectonics process accelerated fast at this time, which was caused by a faster expanding Earth-Mantle.

Key-Maps for the further analysis of the Pacific Plate :



Free air gravity map of northern Pacific (Sandwell 2005). Identified magnetic lineations in the north Pacific, labeled with Chron-Numbers. The heavy black lines track triple junctions, dashed where inferred. The Japanese and Hawaiian lineations of the M-Sequence arOFZ-Molokai fracture zone mostly west of Hawaii-Emperor chain; they are numbered with the M-prefix. Thin magenta lines represent fracture zones: HT-Hokkaido Trough; SR-Shatsky Ridge; ET-Emperor Trough; CT-Chinook Trough; MFZ-Mendocino fracture zone; PFZ-Pioneer fracture zone; UFZ-Murray fracture zone;

The Gravity Anomaly Map above, shows the NW-Pacific Plate with Chron Numbers of magnetic lineations (→ see Table !).

The paths of different Magma Eruption Fronts (No. 1 - 8) from the Cape York Crater (CYC), over a period of ~200 Ma (≥ 8 eruptions), are indicated by different colored lines on the shown maps.

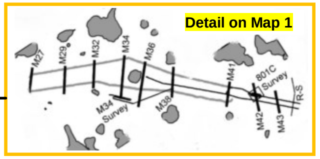
The lines indicate the approximate paths (directions) of the different magma fronts relative to their source areas, and relative to their final locations on the continental plates (→ final locations = collision zones with the continental plate, starting points = CYC magma chamber at time of event)

Between the different magma eruptions of the CYC there were quiet time periods (breaks) of ~ 20 to 50 Ma. Each of these magma eruptions left distinct marks = evidence (→ LIP'S, volcanic areas, cracks etc.) on the Pacific Plate. See further explanations on the following pages !

See Study :

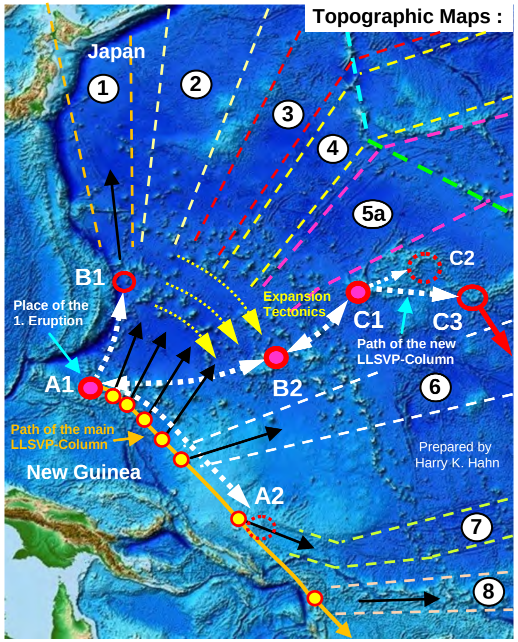
Origin of the Pacific Jurassic quiet zone :

Magnetic Lineations
M 35 – M 44



Chron Numbers of Magnetic Lineations in North-Pacific

West of Hawaii-Emperor Chain		East of Hawaii-Emperor Chain	
M-sequence	Age (Ma)	C-sequence	Age (Ma)
M 0	118	C 4	20
M 1	122	C 6	23
M 3	125	C 8	27
M 5	128	C 10	30
M 10	130	C 12	33
M 14	138	C 14	36
M 16	142	C 16	39
M 18	145	C 18	42
M 20	147	C 20	46
M 22	150	C 22	52
M 25	155	C 24	56
M 29	158	C 26	61
M 33	160	C 28	66
M 35	163	C 31	70
M 38	165	C 32	72
M 44	170	C 33-C34	74-84

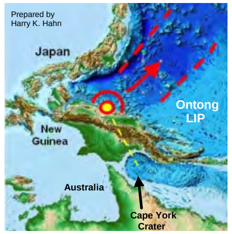


● Source Area
➡ Path of Source Area
→ Eruption Path
ⓧ Eruption No.
●○ Drift-off copies of source area 1

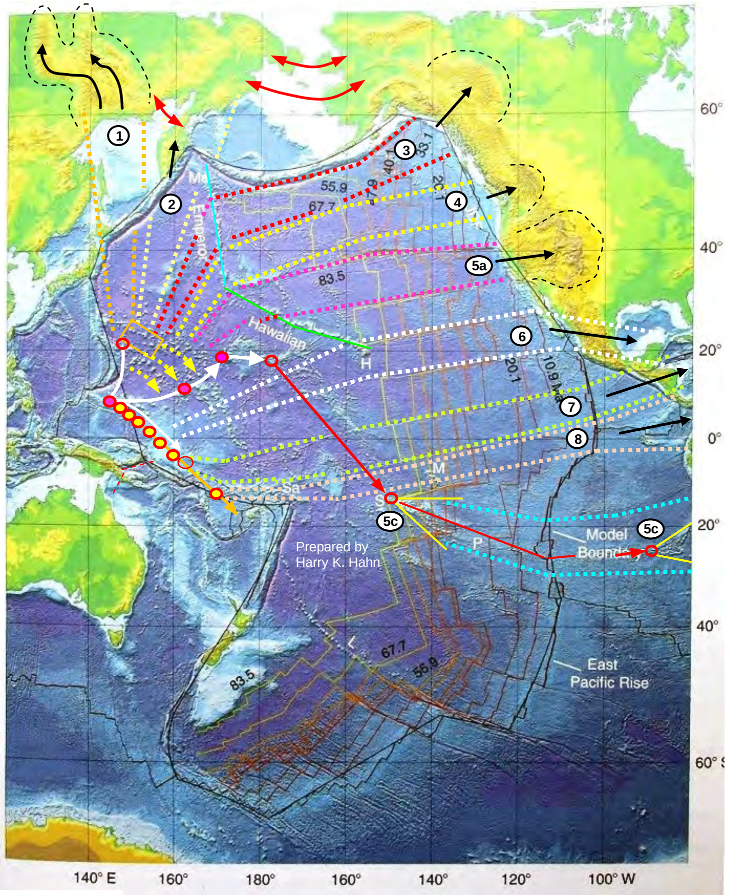
A2, B1-2,C1-C3 :
Chronological order (age) of the "Drift-off-copies" of source area 1 (A1)

The small map on the right shows the situation around the **3.** or **4.** magma eruption

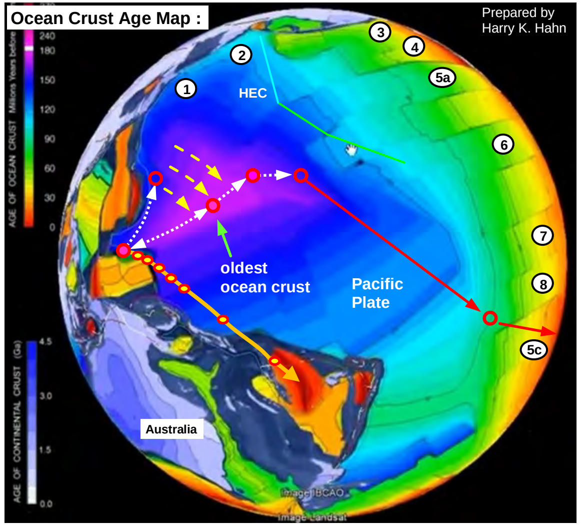
The eruptions started on the north-coast of New Guinea

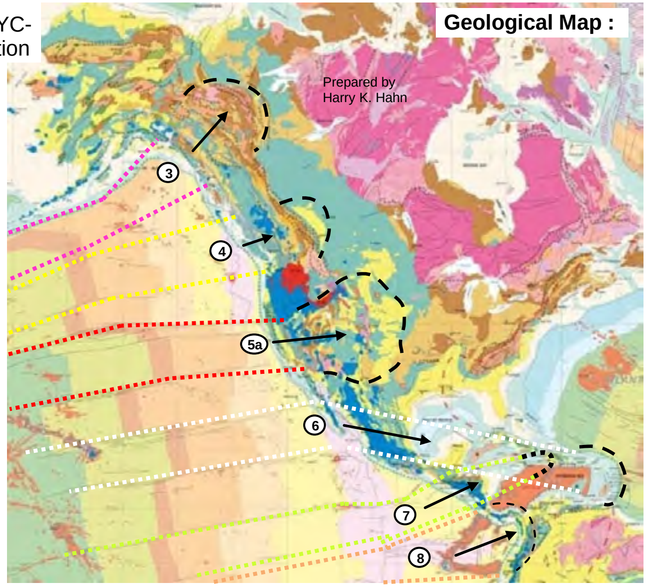


The larger map above shows the path of the source of the magma eruptions (yellow dots on orange arrow). Today it is located near the Fiji-islands. The source, a LLSVP resulting from the PTI- & CYC-Impact, has formed another LLSVP-column (B2) after the 1.eruption



The maps on the right show the paths of all magma eruptions





The evolution of the Pacific Plate a short time after the fifth magma eruption of the Cape York Crater :

The following drawing shows what happened around 65 Ma ago when the fifth magma eruption of the Cape York Crater happened.

This sketchy drawing isn't precisely to scale. But it is illustrating this violent magma eruption for the first time !

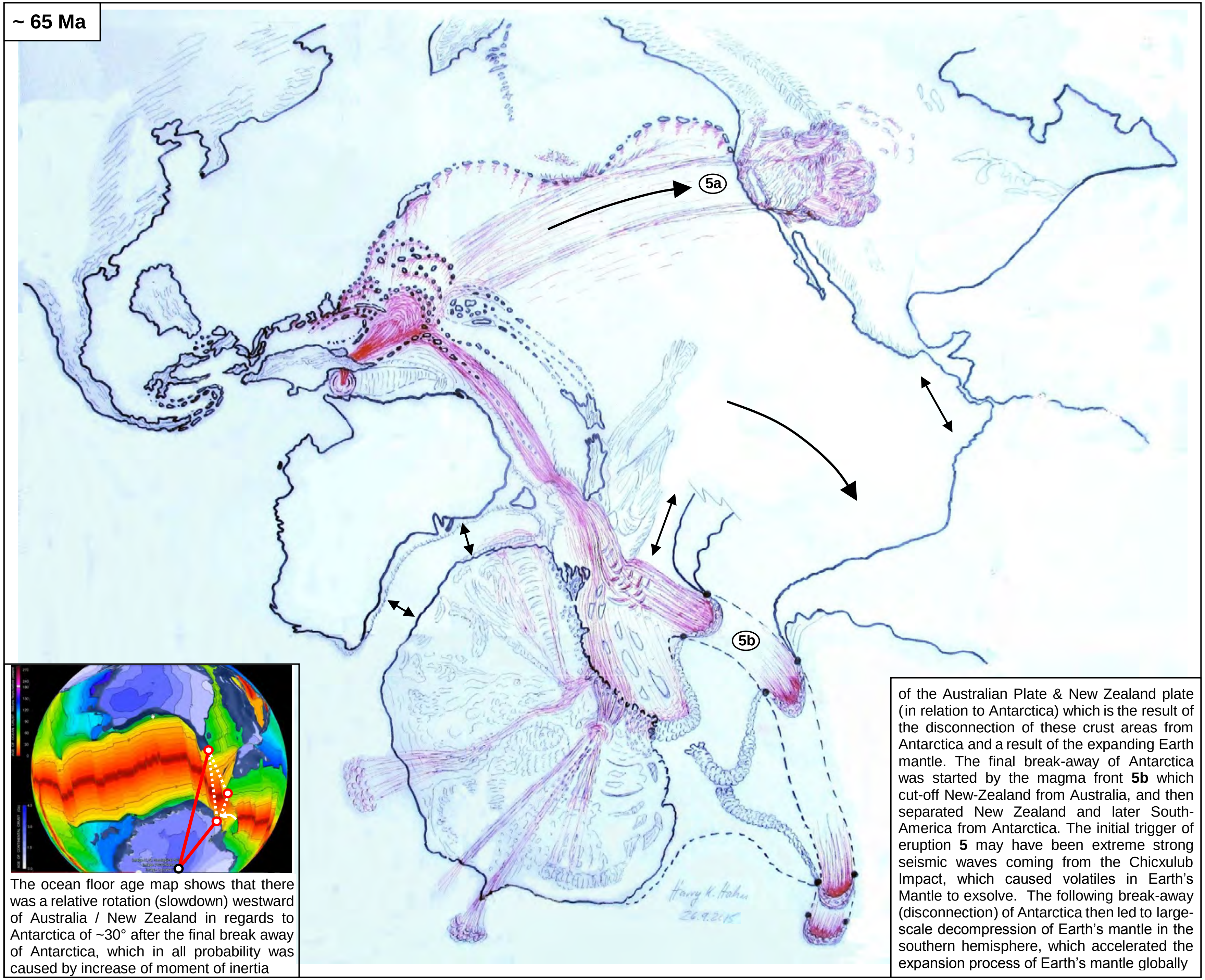
And so it gives some insight in this distant event which is important for the understanding of the evolution of the Pacific Plate.
It also shows how Antarctica was involved in the event

The trigger for this violent magma eruption may have been the Chicxulub Impact 65 Ma ago, which caused extreme earthquakes with values >12 (RS). This magma eruption surely contributed to the extinction of the dinosaurs

Beside the main magma front **5a** this eruption caused another magma front **5b** which moved south towards Antarctica, where it triggered the final breaking away of Australia/NZ & South-America from the continent Antarctica

It probably caused (indirectly) another large "secondary eruption" **5c** near French Polynesia (not shown).

The eruption **No. 5** at first has triggered the final break away of Australia / New Zealand & South-America (& Africa) from Antarctica, which then led to a faster expanding Earth Mantle

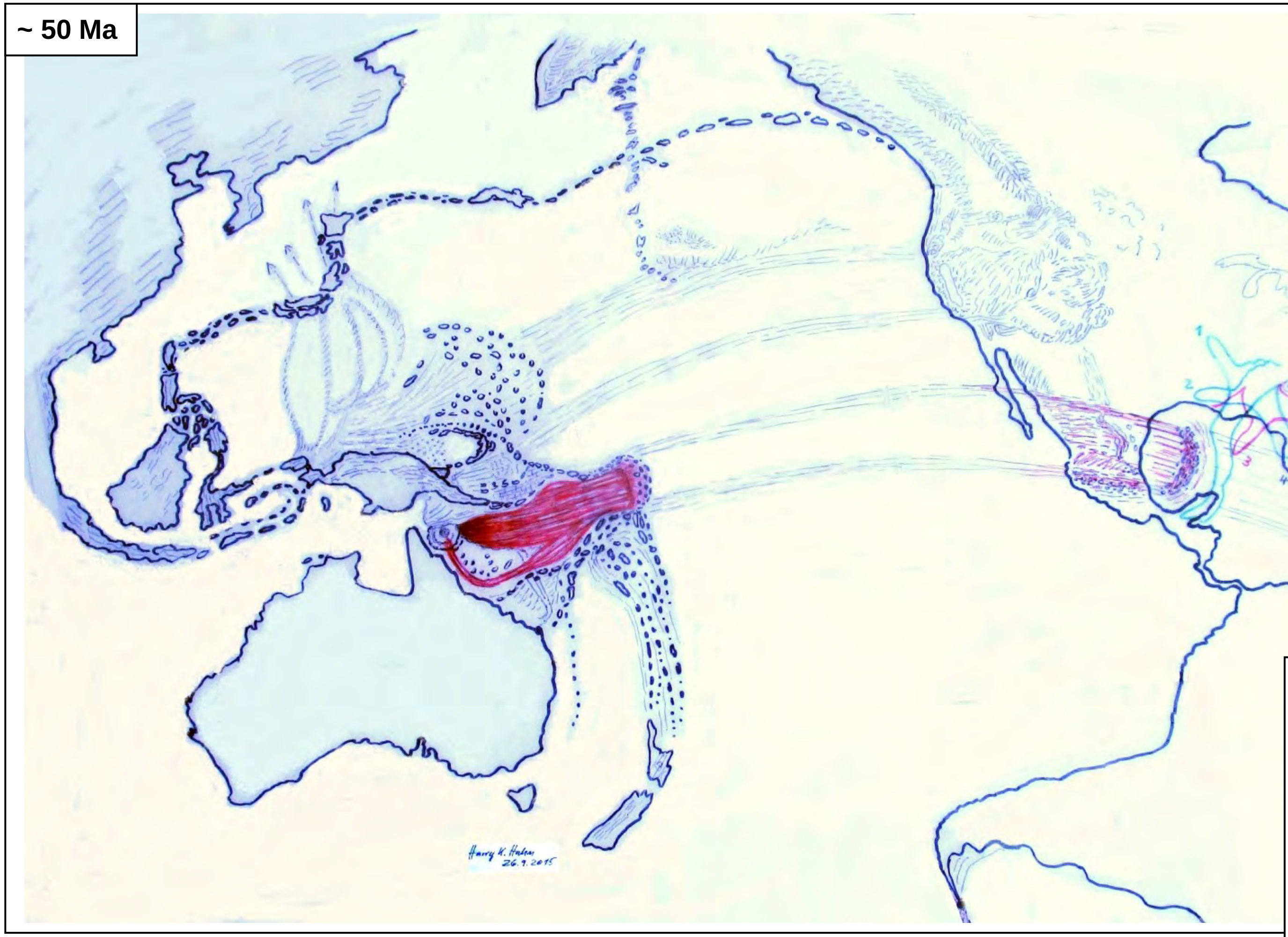


The ocean floor age map shows that there was a relative rotation (slowdown) westward of Australia / New Zealand in regards to Antarctica of ~30° after the final break away of Antarctica, which in all probability was caused by increase of moment of inertia of the Australian Plate & New Zealand plate (in relation to Antarctica) which is the result of the disconnection of these crust areas from Antarctica and a result of the expanding Earth mantle. The final break-away of Antarctica was started by the magma front **5b** which cut-off New-Zealand from Australia, and then separated New Zealand and later South-America from Antarctica. The initial trigger of eruption **5** may have been extreme strong seismic waves coming from the Chicxulub Impact, which caused volatiles in Earth's Mantle to exsolve. The following break-away (disconnection) of Antarctica then led to large-scale decompression of Earth's mantle in the southern hemisphere, which accelerated the expansion process of Earth's mantle globally

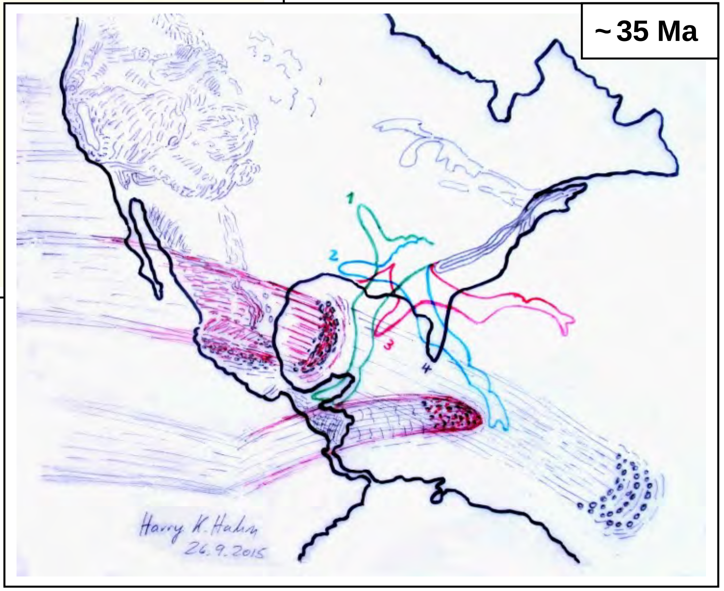
The sixth magma eruption of the Cape York Crater :

Prepared by Harry K. Hahn

This sixth magma eruption of the Cape York Cater wasn't as strong as the fifth eruption, but it still was a violent event which considerably influenced the shape of the North-American Continent. The sixth magma eruption happened around 10-20 million years after the fifth eruption. Probably around 55-45 Ma ago. Since the last eruption Australia has moved further to the South, as a result of the impact impulse of the **PT**-Impact. In contrast Japan and a chain of smaller crust fragments have moved further to the North. The anti-clockwise rotation of New Guinea, Borneo and the Philippines around the impact- and eruption zone continued, and they also drifted further away from this area, as a result of the Impact Impulse of the Cape York Impact and the first five magma eruptions of the Cape York Crater



When the magma front, caused by this eruption, later collided with the North-American Plate, it pulled out a stripe-like crust fragment and bended this fragment on it's path westward where it eventually collided with the continental plate and formed the Appalachians. (step 1 to 4 as indicated on the map below)

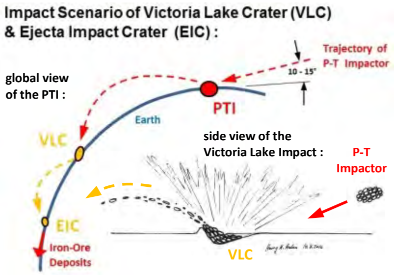


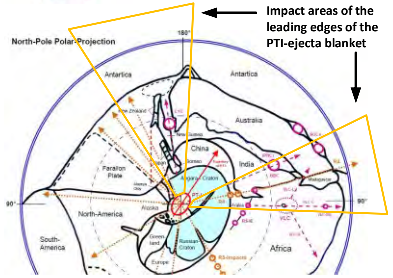
The seventh magma eruption :

The magma front of the seventh magma eruption, which happened around 30-40 Ma ago (→10-20 Ma after the sixth eruption), eventually crossed Middle-America and moved further eastward into the Caribbean Sea. The tip of this magma front is now located near Haiti. Since the fifth eruption which initiated the final break-away of South-America from Antartica and from New Zealand, the expansion tectonics process in the south-pacific area accelerated.

The Pacific - LLSVP, which is responsible for the magma eruptions, and the African - LLSVP were caused by the PT-I :

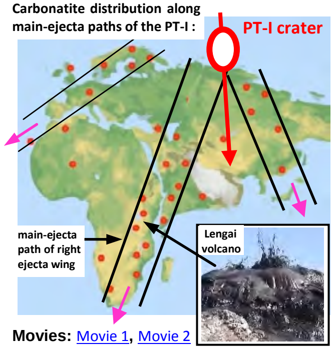
There is strong indication that the **Permian-Triassic Impact (PT-I)** and the ejecta rays which were caused by this enormous impact are responsible for the formation of the two main **LLSVPs** (Large low-shear-velocity provinces) inside Earth's mantle. These two large structures, which are characterized by slow (seismic) shear wave velocities and which consist of much hotter material (~4000°K) than the surrounding mantle material (~2000°K), extend laterally and vertically for thousands of kilometers from the core-mantle boundary. In all probability the remains of large secondary impactors and the powerful ejecta of the leading edges of the two ejecta-wings of the PT-I descended deep into Earth's Mantle and caused the **LLSVP's** as a result.


Impact Scenario of Victoria Lake Crater (VLC) & Ejecta Impact Crater (EIC) :



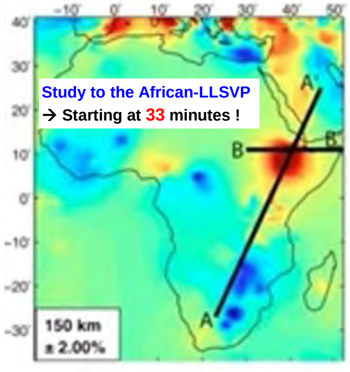
The diagram on the left shows the shallow (oblique) impact of the PT-Impactor which probably had a diameter of around **~60 to 150 km**. It also shows a side view of the **Victoria Lake Impact** (crater) (→VLC) which was caused by a large secondary impactor ejected from the PTI-crater. Part of the ejecta from the VLC was ejected forward in impact direction where it formed another secondary crater, the EIC. The rest (the majority) of the VLC-ejecta was again ejected in a butterfly-ejecta-pattern. Traces of "forward-ejecta" , which always seems to be dense & ductile metal-bearing material, are also visible near the CYC- and PHC (BBC)-craters.

The majority of the ejecta from the PTI-crater was ejected in the form of a gigantic butterfly-shaped ejecta blanket. Where the leading edges of the two ejecta wings of this butterfly-ejecta blanket impacted on Earth's crust (in the yellow marked areas) extensive fractures (new continent borders) were formed The north-polar-projection of Earth, shown on the left shows Earth at P/T boundary time


Carbonatite distribution along main-ejecta paths of the PT-I :
PT-I crater
main-ejecta path of right ejecta wing
Lengai volcano

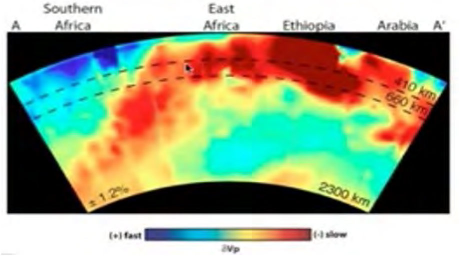
Movies: Movie 1, Movie 2

see : **Study about Carbonatite Lava**


Study to the African-LLSVP
→ Starting at 33 minutes !

A large part of the ejected material and a number of big secondary impactors impacted in these two yellow marked areas. → see also larger map in the chapter : **"Earth at the time of the PT-Impact Event"**

The world map on the left shows the distribution of **Carbonatites** in Africa & Eurasia. I have rearranged the position & orientation of Africa, Europe and India so as they were just after the PT-Impact 253 Ma ago (→original map, Le Bas 1987). **It is clearly visible that the carbonatites are mainly located along the paths where the leading edges of the ejecta wings of the PTI impacted !!** This is especially clear for the impact path of the leading edge of the right ejecta wing along the east-coast of Africa (→ ejecta ray R4 & VLC-ray). Because the Carbonatites are probably derived from Earth's lower mantle, we can conclude that the shock-wave of the PTI-impact, or PTI-ejecta descending into the mantle, brought carbonatites from the lower mantle to the surface, or the carbonatites were brought-in by the impactor itself ! Lengai Volcano in Tanzania still erupts Carbonatite-Lava today ! (→ from the African LLSVP !)



The two images on the bottom left side show a section view of the **African-LLSVP**. The section view A – A' runs from the Arabian Peninsula through the African Rift Valley and the Victoria Lake (VLC) area towards South-Africa. The section view runs essentially along the same path where the leading edge of the right ejecta wing of the PTI impacted.

It is clearly visible that the main structure of the African **LLSVP** is orientated along the same path as the impacting right leading edge of the PTI-ejecta.

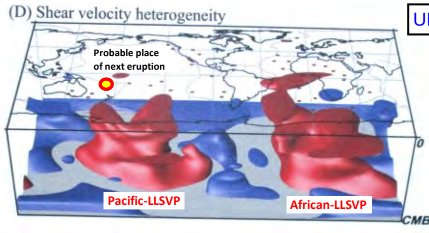
(→ LLSVP = red, orange & yellow area in the section view A – A'). The images are from a study of Andy Nyblade which used **African-Array Data**. He claims that evidences indicate that the African LLSVP is a thermochemical whole-mantle-structure without a separation in the 410-660 km region.

The same principles applies for the **Pacific LLSVP** The two maps on the top right side show that especially the **ULVZ** at the **core mantle boundary (CMB)** within the Pacific LLSVP is mainly orientated along the path where the leading edge of the left ejecta wing of the PTI impacted. Because this ULVZ has a distinct chemical signature there is a high probability that the **ULVZ** is a direct result of ejecta of the PTI which descented to the CMB in this area.

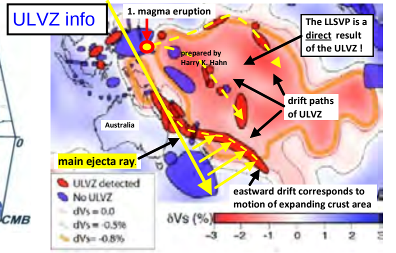
Note: it seems that the Cape York Impact produced a permanent channel in the mantle which connects the Pacific-LLSVP / ULVZ with the surface. Through this channel in the mantle ≥8 violent magma eruptions occurred over the last ~200 Ma causing a number of big **LIP's** on the Pacific Plate (e.g. the **Ontong LIP**)

Warning : There is a high probability that another such violent magma eruption will occur !! My study indicates that the next magma eruption will take place near the **Fiji-islands** → see image on the right which shows the path of the source (outflow channel positions = yellow dots) of the magma eruptions. It seems the Pacific LLSVP is due for an eruption soon ! The solid upward pointing column at the top-end of the LLSVP, near the **Fiji's** may indicate the coming eruption (& mass extinction !). The vertical expansion rate of this column must be measured !!!

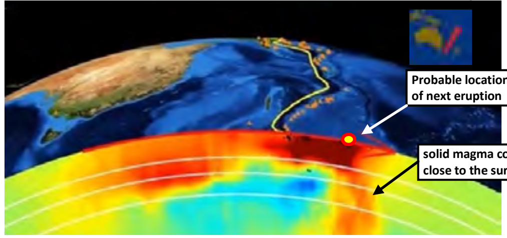
Note : All volcanos of the **Pacific Fire Ring** and all other volcanos on Earth can be explained by the Permian-Triassic Impact ! They are all located in the (fractured) crust areas which were directly caused by the ejecta of the PT-I !! The magma (molten mantle material) which causes these volcanos, in all probability is exclusively a result of the impact of ejecta & secondary impactors from the PTI !!! Therefore a revised model for **Earth's mantle** is required, which must consider a much higher share of volatiles, e.g. H_2O & CO_2 within the mantle material


(D) Shear velocity heterogeneity
Probable place of next eruption
Pacific-LLSVP
African-LLSVP
0
CMB

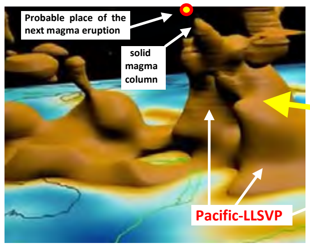
A 3-D view of the Pacific- & African LLSVP and the probable location of the next eruption



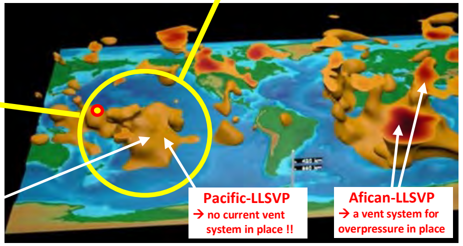
The Pacific-ULVZ is orientated along the path of a main ejecta ray of the PTI


Probable location of next eruption
solid magma column close to the surface

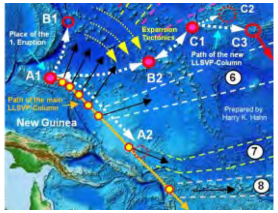
3D-Model No. 1 of Pacific LLSVP → see : 3D-Animation 1
3D-Model No. 2 of Pacific LLSVP → see : 3D-Animation 2



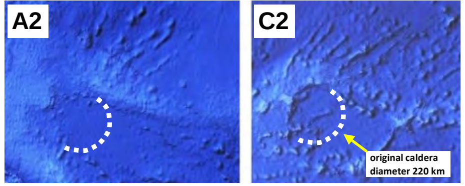
3D-view of Pacific-LLSVP with the possible location of next eruption


Pacific-LLSVP
→ no current vent system in place !!
Afican-LLSVP
→ a vent system for overpressure in place

This 3-D Animation shows the African-LLSVP has a large vent system for overpressure in place, but the Pacific-LLSVP doesn't !


B1
Place of the 1. Eruption
Expansion Tectonics
C2
C1
C3
Path of the new LLSVP-Column
A1
B2
6
Path of the main LLSVP-Column
Prepared by Harry K. Hahn
New Guinea
A2
7
8

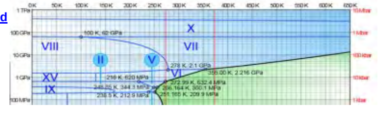
Path of the magma eruption source (→ yellow dots). A2, B1&B2, C1-C3 represent drift-off-copies & remains of the first magma-eruption-zone A1

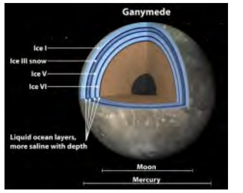


These two different ocean floor areas A2 & C2 which are thousands of km apart represent the same structure !!
These "drift-off-copies" are an image of the first magma eruption which took place on position A1 ! These nearly identical structures, from two different crust layers (?), probably show the remains of a burst shield-volcano with a base ø ~450 km and a caldera ø ~220 km.

An alternative model for Earth's mantle is required !! Earth's mantle in all probability contains much more volatiles, especially **H_2O**, than currently believed ! Similar to **Ganymede**, Earth's mantle may contain a high share of high-pressure ice, e.g. **Ice X** & **Ice XI**, probably mixed with silicate material like in Callisto's mantle and other materials. **H_2O** may also be stored in materials like **Ringwoodite** etc.

Ringwoodite in Diamond





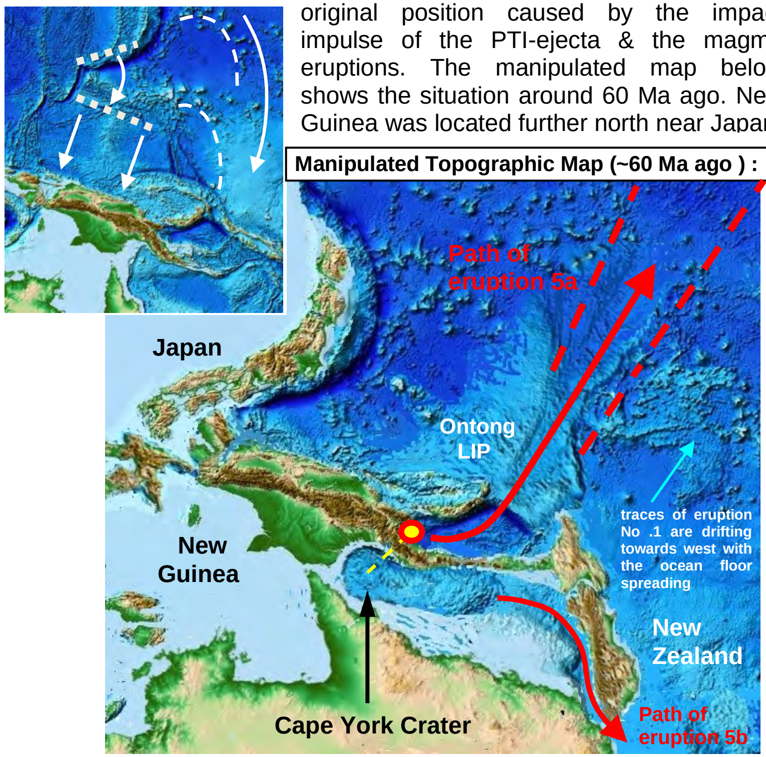
The magma eruptions No. 5 to 8 of the Cape York Crater shown in more detail :

Starting Point of magma eruption No. 5 :

original Map: **New Guinea position today**

The white markings on the left map indicate the shift & rotation of New Guinea from its original position caused by the impact impulse of the PTI-ejecta & the magma eruptions. The manipulated map below shows the situation around 60 Ma ago. New Guinea was located further north near Japan

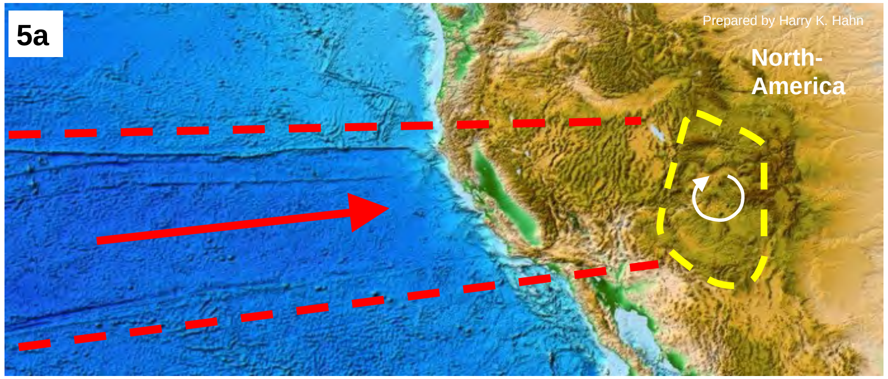
Manipulated Topographic Map (~60 Ma ago) :

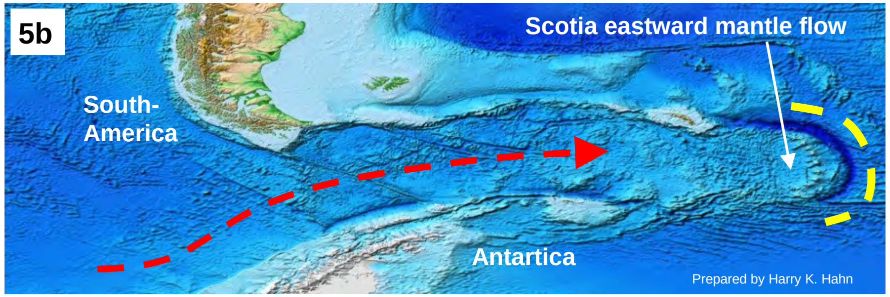


The collision zones of magma eruption No. 5 : (~ 65-60 Ma)

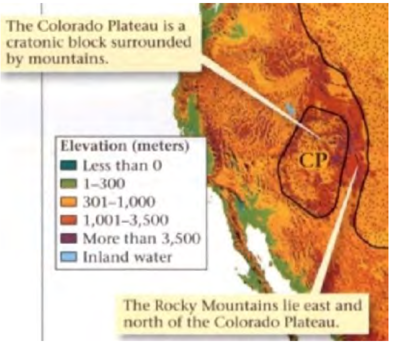
Prepared by Harry K. Hahn

The main front of eruption No. 5 collided with the westside of North-America





Another magma front (5b) produced by the strong magma eruption No. 5 of the Cape York Crater eventually separated (split-up) South-America from Antartica and thereby accelerated the expansion of the Pacific Plate in its southern section.


The Colorado Plateau is a cratonic block surrounded by mountains.
Elevation (meters)
Less than 0
1–300
301–1,000
1,001–3,500
More than 3,500
Inland water
CP
The Rocky Mountains lie east and north of the Colorado Plateau.

The Colorado Plateau is part of this magma front which was driven deep into the North-American Plate by magma eruption No. 5. The Rocky Mountains and the Basin & Range Province are a result of the collision of this powerful magma front with the North-American Plate. The Rocky Mountains formed in front of it, and the Basin & Range Province formed behind it. Note that the Colorado Craton also seems to rotate slowly clockwise on its path towards east !

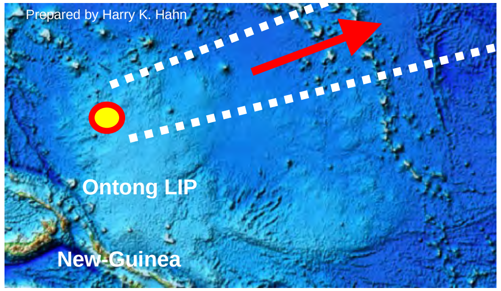
The trigger for this magma eruption No. 5 of the CY-Crater may have been the Chicxulub Impact which caused earthquakes > 12 RS.

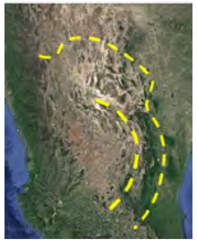
The collision of Magma Front No. 5 may also explain the descent of the Farallon Plate under the North-American Plate.

Starting Point of eruption No. 6

The starting point of magma eruption No. 6 is located in the large **Ontong LIP** area.

Note the similarity of size and shape of magma front No. 6 (→ see current location) and the central mountain range in Mexico.



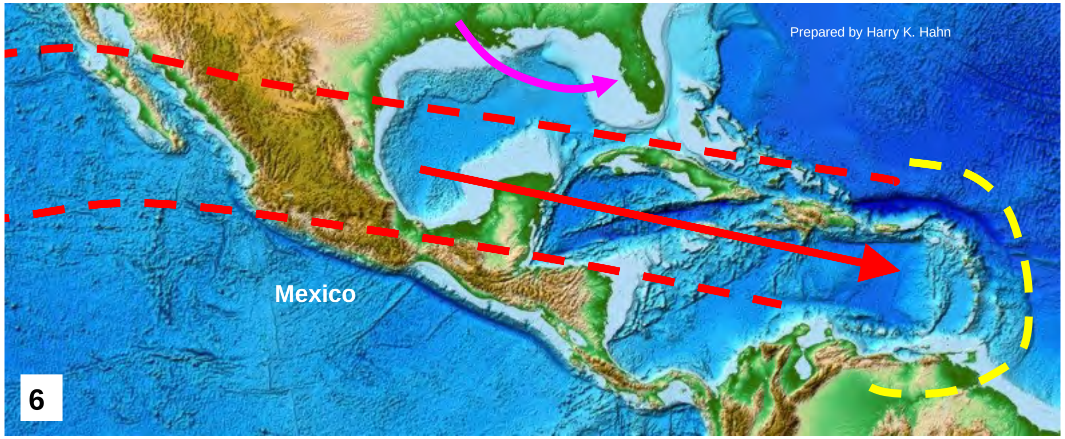


satellite images

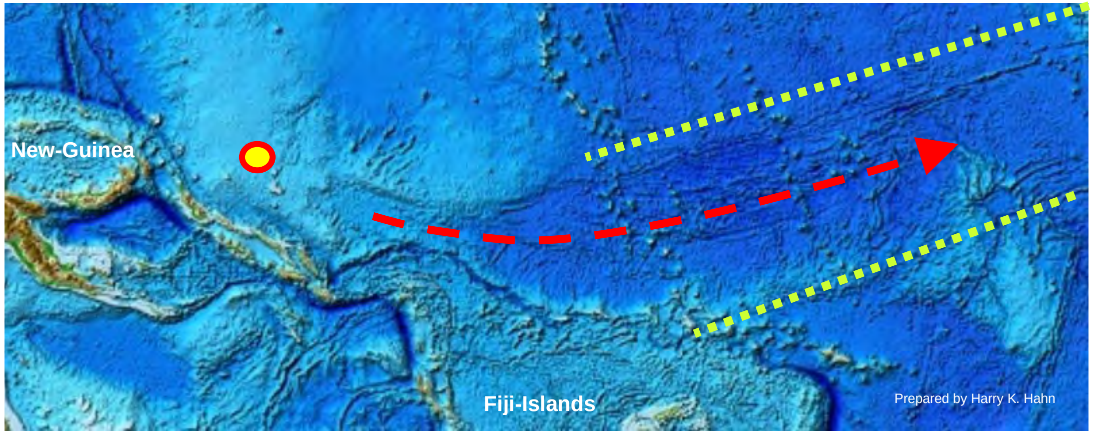
The result of magma eruption No. 6 : (~ 55-45 Ma)

The magma front of eruption No. 6 crossed Mexico, then moved further through the Golf of Mexico to its current location near the coast of Venezuela.

On its way it ripped out Florida and a long area of the north coast of the Golf of Mexico and rotated (bended) this stripe-like fragment of Earth's crust to the western side of the North-American Plate, where it formed the Appalachians when it collided there with the continental plate.

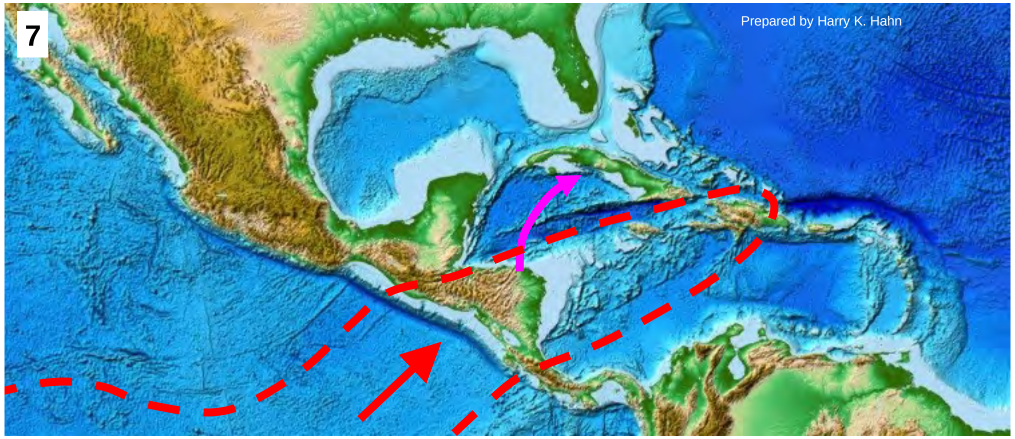


Starting point of magma eruption No. 7 :

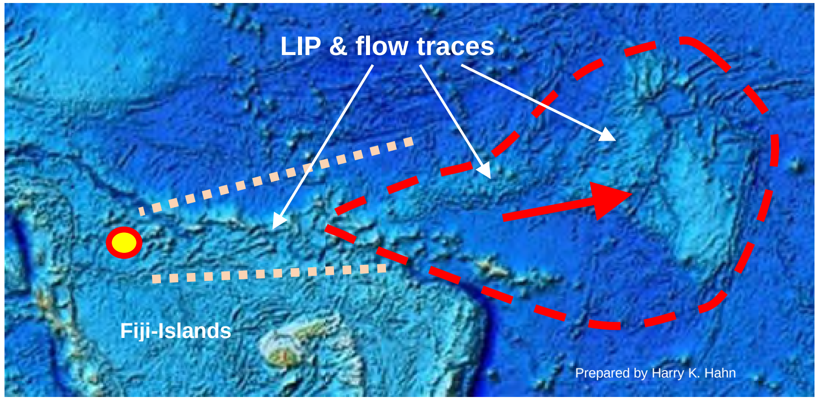


The result of the magma eruption No. 7 (~30-40 Ma) :

Magma eruption No. 7 crossed Middle-America and moved deep into the Caribbean Sea.



Starting point & flow traces of magma eruption No. 8 :

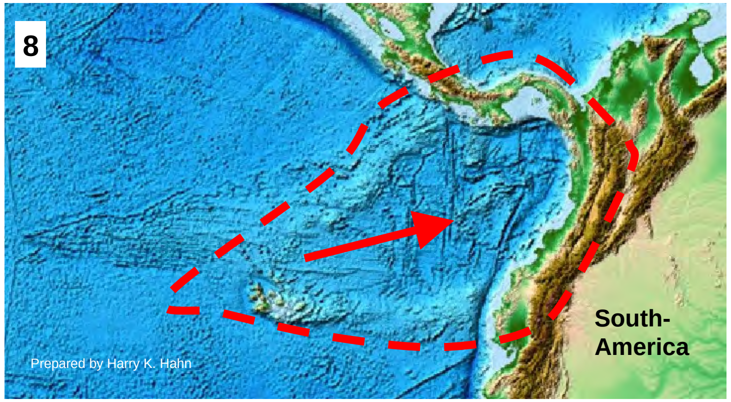


Note that the size and shape of the LIP, which is located in the path of the magma eruption No. 8, is very similar to the shape and size of the assumed collision zone of the magma front No. 8 with the South-American Plate ! The location of the initial magma eruption was ~ 1000 km NW of the Fidschi-Islands.

The collision zone of magma front No. 8 : (~ 25 Ma)

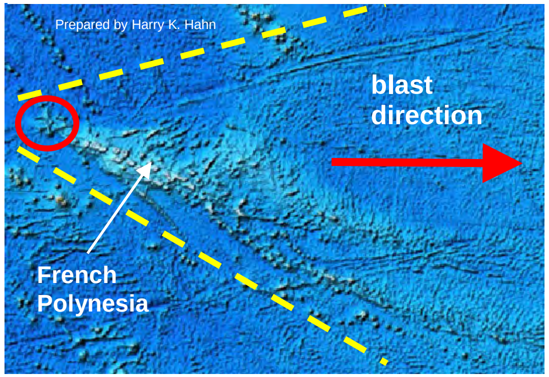
The collision zone of magma front No. 8 matches the LIP which is located close to the starting point of this magma Eruption.

Therefore there is a high probability that the deformation on the South-American Plate indicated in this image is a direct result of this LIP (→ eruption No. 8)



The starting point of magma eruption No. 5c :

French Polynesia is a result of a LLSVP caused by the 1. CYC-eruption & reactivated at the 5. eruption



The shape of French Polynesia and the flat-topped volcanos (→tops were blasted away !), are an indication of the later CYC-magma eruptions (blasts) →No. 6 to 8.

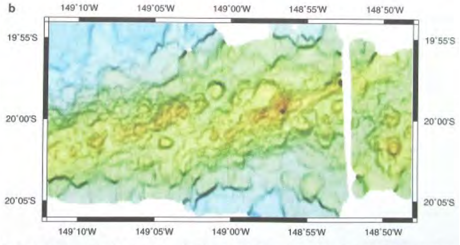
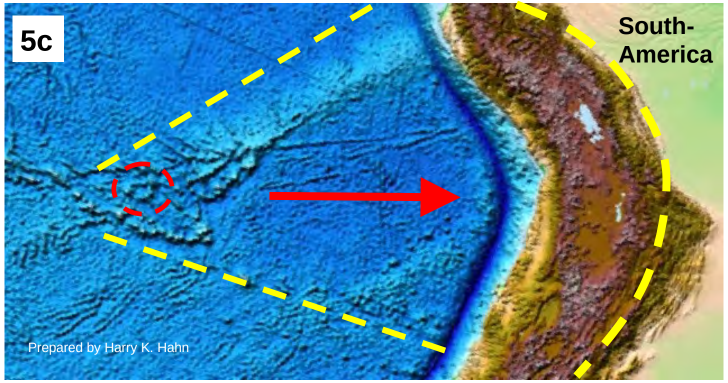


Fig. 1.12. a Bathymetry of a segment of the Va'a Tau Piti Ridges near Tahiti (Clouard et al. 2003). These volcanic ridges are clearly constructed by the superposition of many small, flat-topped volcanic cones. The Simrad EM12D, Hydrosweep DS and SeaBeam multibeam bathymetry is shown using a 100 m grid interval and shading by slope magnitude. **b** Detail of volcanic morphology of ridges in region shown by box in **a**

The collision zone of magma eruption No. 5c : (~ 65-60 Ma)

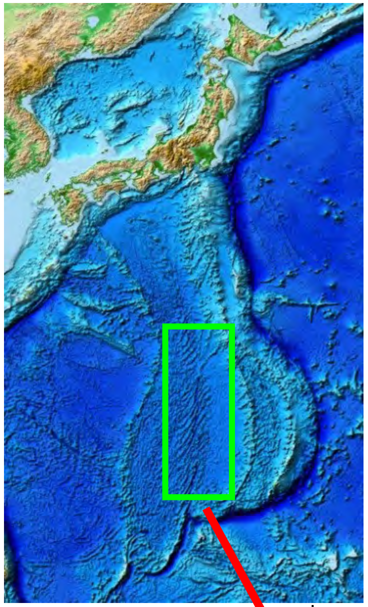
Magma eruption No. 5c is a special case, because it didn't come from the same source area as the other eruptions. The first CYC-Crater eruption caused a LLSVP which first drifted west and later south-west, where it then produced an eruption at the time of the 5. eruption period.

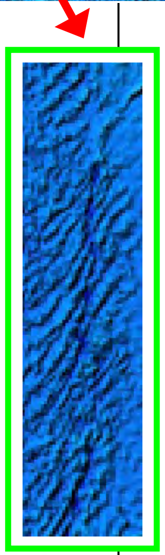


The following images explain the motion of the crust fragments which formed Japan and the Appalachians

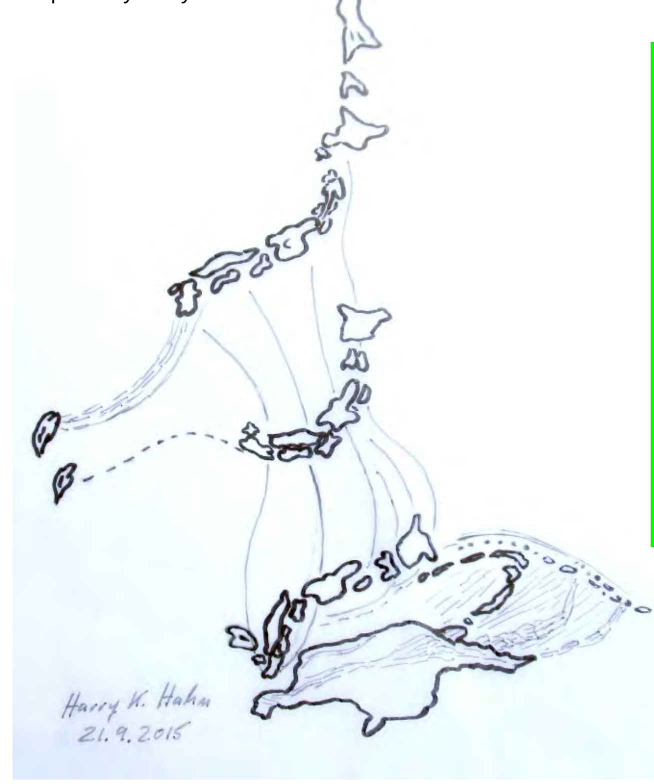
Note the traces which were left on the oceanic crust, on which Japan “slipped” to its present position. These traces give detailed information about the orientations (the exact angle positions) of some of the fragments of Japan, during the successive “Slip-Events”

The image below shows the motion of the crust fragments which formed Japan, which originate on the north-coast of New Guinea. This motion was triggered by the magma eruptions (1 to 5) of the Cape York-Crater

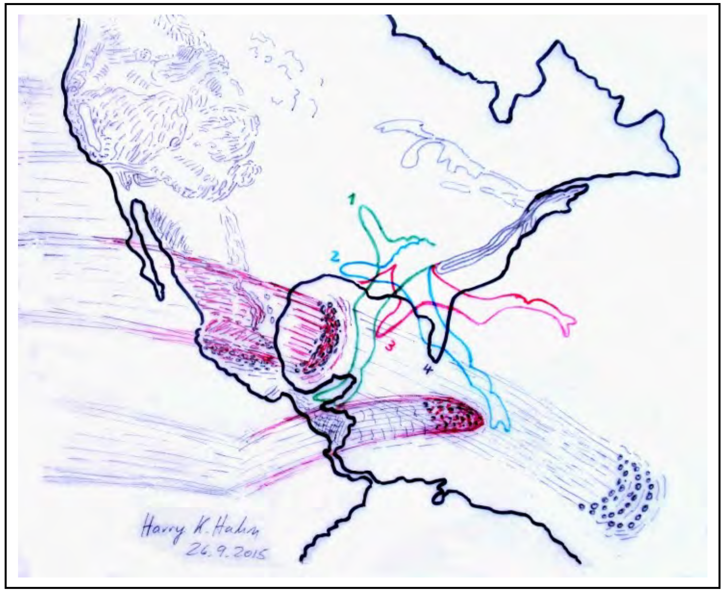




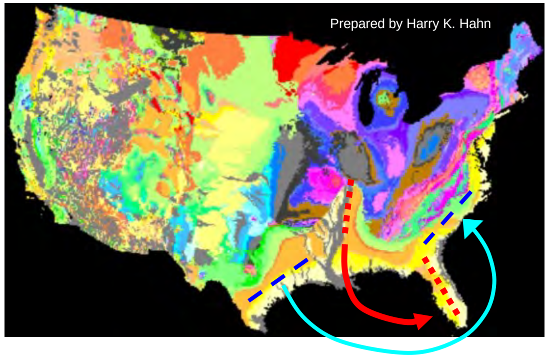
Prepared by Harry K. Hahn



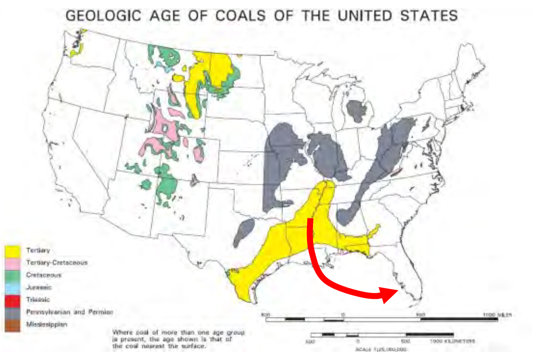
Harry K. Hahn
21.9.2015



Harry K. Hahn
26.9.2015



Prepared by Harry K. Hahn



Where coal of more than one age group is present, the age shown is that of the coal nearest the surface.

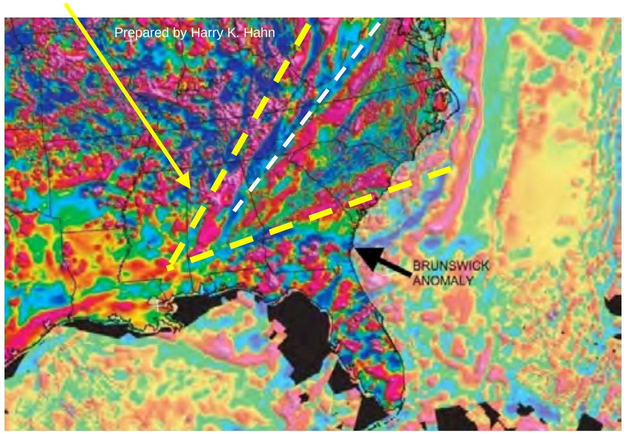
Prepared by Harry K. Hahn

These maps all indicate the motion of the crust fragment which has formed the Appalachians.

The Google satellite image clearly shows the 180° bend of this crust fragment.

And the geological map and the coal-age map on the lefthand side nicely show where Florida and a long section of coast area of the Golf of Mexico have been located before the magma eruption No. 6 of the Cape York Crater took place.

Please note how nicely Florida fits into the Mississippi-river-area. My drawing illustrates the motion. And the magnetic anomaly map below shows the apex of the bend an the folding as such.



Prepared by Harry K. Hahn

Features on the ocean-floor age map which provide proof for the magma eruptions of the Cape York Crater

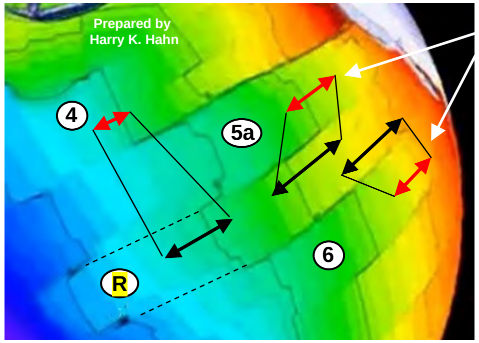
There are features and marks visible on the ocean-floor map which provide proof for the above described magma eruptions of the Cape York Crater.

These magma eruptions caused shearbreaks in the oceanfloor through the strong impulse which these eruptions induced in the ocean-floor when the magma material was ejected on it, and decelerated on it, through friction (towards east).

The ocean-floor shear-cracked over a long distance, mainly in the direction in which the magma material was ejected to. For the magma eruptions No. 5 to 8, were the magma was ejected towards east, this is indicated by a considerable shift and expansion of the corresponding "ocean-floor-stripes" towards East.

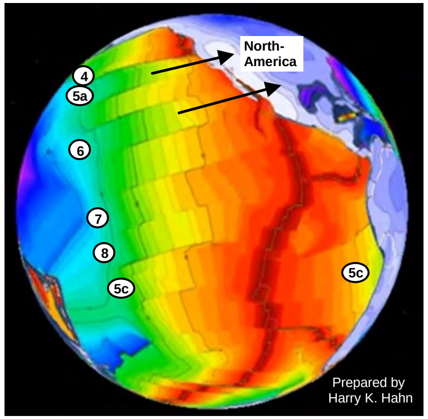
The widths of the ocean-floor-stripes, which are ~1200-1600 km, give information about the widths of the "magma fronts" which were ejected on the ocean floor.

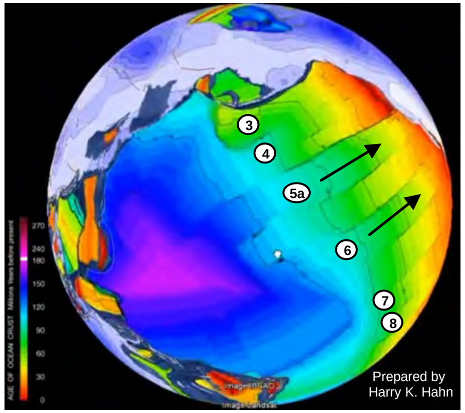
The stripes with the greatest shift towards east, visible on the ocean-floor-age map, were effected by the most severe magma eruptions. These are in particular the stripes marked with **5a & 6**. These two stripes experienced particular strong acceleration by the magma material (magma fronts) , towards east.
One important feature, which is a strong indication for the described scenario of the magma eruptions towards east, is the compression of certain sections of these stripes, in particular on the stripes **5a & 6.** Compared with a reference stripe **"R"** , the marked sections (red) are clearly compressed !
The compressed sections on the stripes roughly indicated the time of the eruption, because the magma decelerated on this "new" crust area before it fused to the NA-continent.
However also other information must be used to find the exact times of the eruptions. For example the age of the erupted magma etc.



compressed areas on the ocean floor stripes (red arrows)

The marked areas on the stripes 4, 5a & 6 (red arrows) indicate compressed areas, if compared with reference stripe **"R"** which probably was not effected by an eruption



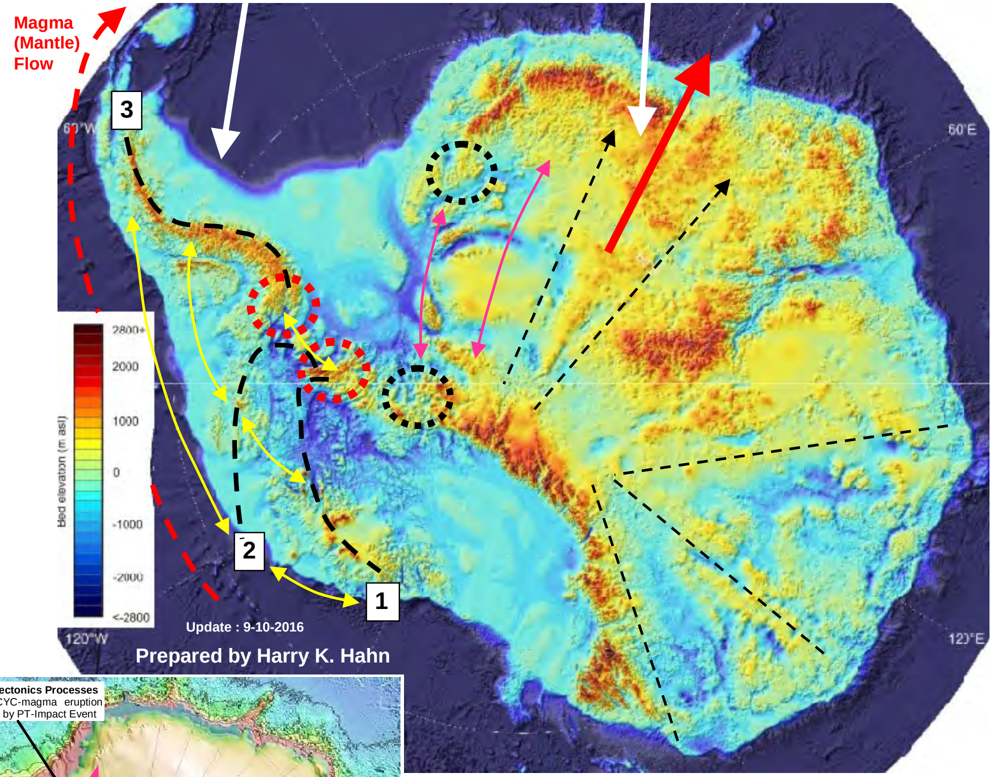


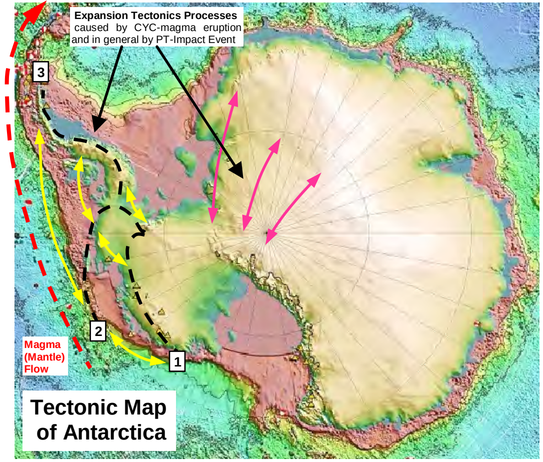
The Topographic Map of Antarctica provides further proof for the strong magma eruption No. 5 of the CY-Crater :

The following map shows where the southern magma flow (5b) from the 5.magma eruption of the CY-Crater first crossed Antartica (red arrow). The main flow then changed direction and flowed along the curved coastline of Antarctica on the left side of the map. The mountain range of the Antarctic Peninsula was deformed and shifted to different locations by the magma (lithospheric) flow (see black dotted lines). Note the "root" of the range (red circle) !

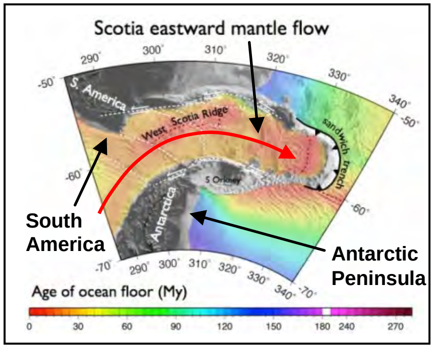
The motion of the Antarctic Peninsula caused by the magma eruption (→ 3 different positions indicated)

Magma flow from the magma eruption No. 5 of the CY-Crater




Expansion Tectonics Processes
caused by CYC-magma eruption
and in general by PT-Impact Event
3
2
1
Magma
(Mantle)
Flow

Tectonic Map of Antarctica



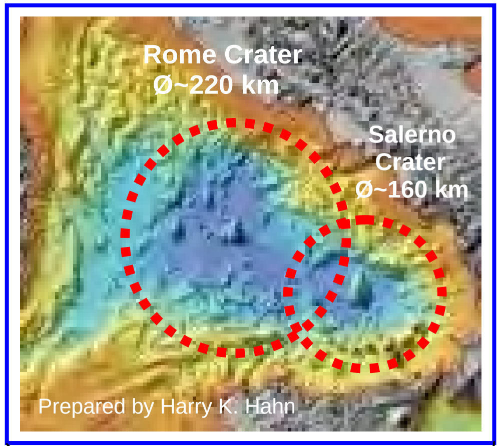
This map shows the present location of the southern front of the magma flow (or lithospheric flow), 5b, of the eruption No. 5 of the CY-Crater.

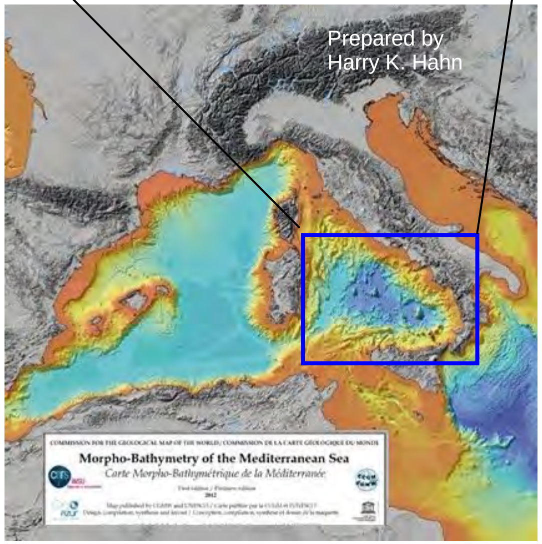
3 Europe was formed by ejecta of the Permian-Triassic - Impact, which impacted in the Mediterranean-area ~253 Ma ago

The following maps and information shall provide first evidence of the impact scenario which took place in the Mediterranean-area at the P/T-boundary. The shown maps describe the whole impact-related process which formed Europe over the last 253 Ma.

The hard evidence for the impact hypothesis are two Impact Craters in Italy, which are already noticable as such on the Tectonic Map of Europe. The estimated diameter of the two craters is ~ 220 km for the western crater (**Rome Crater**) and ~ 160 km for the eastern crater (**Salerno Crater**). → See the following explanation below :

Tectonic Map showing the two impact craters

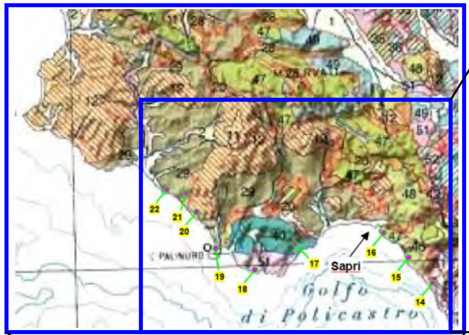



Prepared by
Harry K. Hahn
Morpho-Bathymetry of the Mediterranean Sea
Carte Morpho-Bathymétrique de la Méditerranée

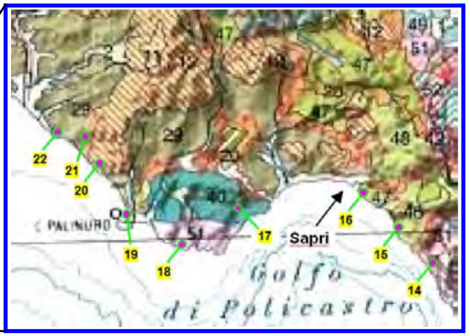
Some first rock samples which were collected close to the assumed impact center of the smaller 160 km crater provide further indication for an impact event !

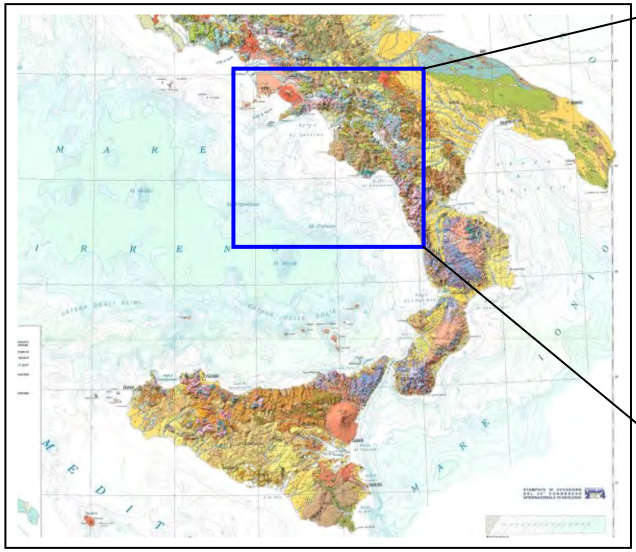
Especially the samples collected on the sample sites 14 & 16 to 22 show various types of breccia, probably all impact breccia, partly with mineral glass inclusions (diaplectic glass). Sample site 21-B near Ascea shows breccia which contains mineral glass. This may be the hard evidence to confirm the described impact-crater and the impact-hypothesis !

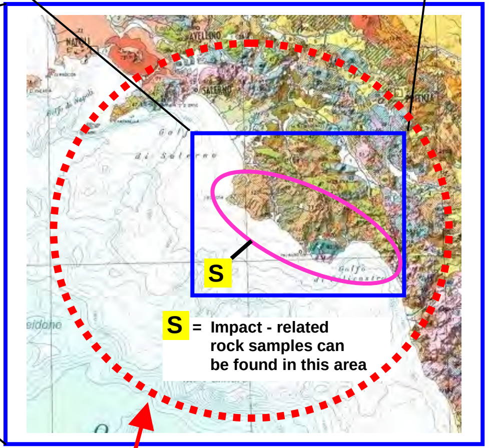
The geological map of Italy is also providing first indication of a ring structure in the south-western part of Italy



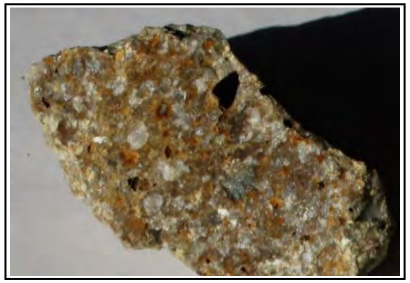
The rock formations on sample site 21-B near Ascea close to the center of the Ø 160 km Salerno Crater show breccia which contains mineral glass (diaplectic glass)







Salerno Crater
estimated crater diameter approx. Ø 160-170 km.

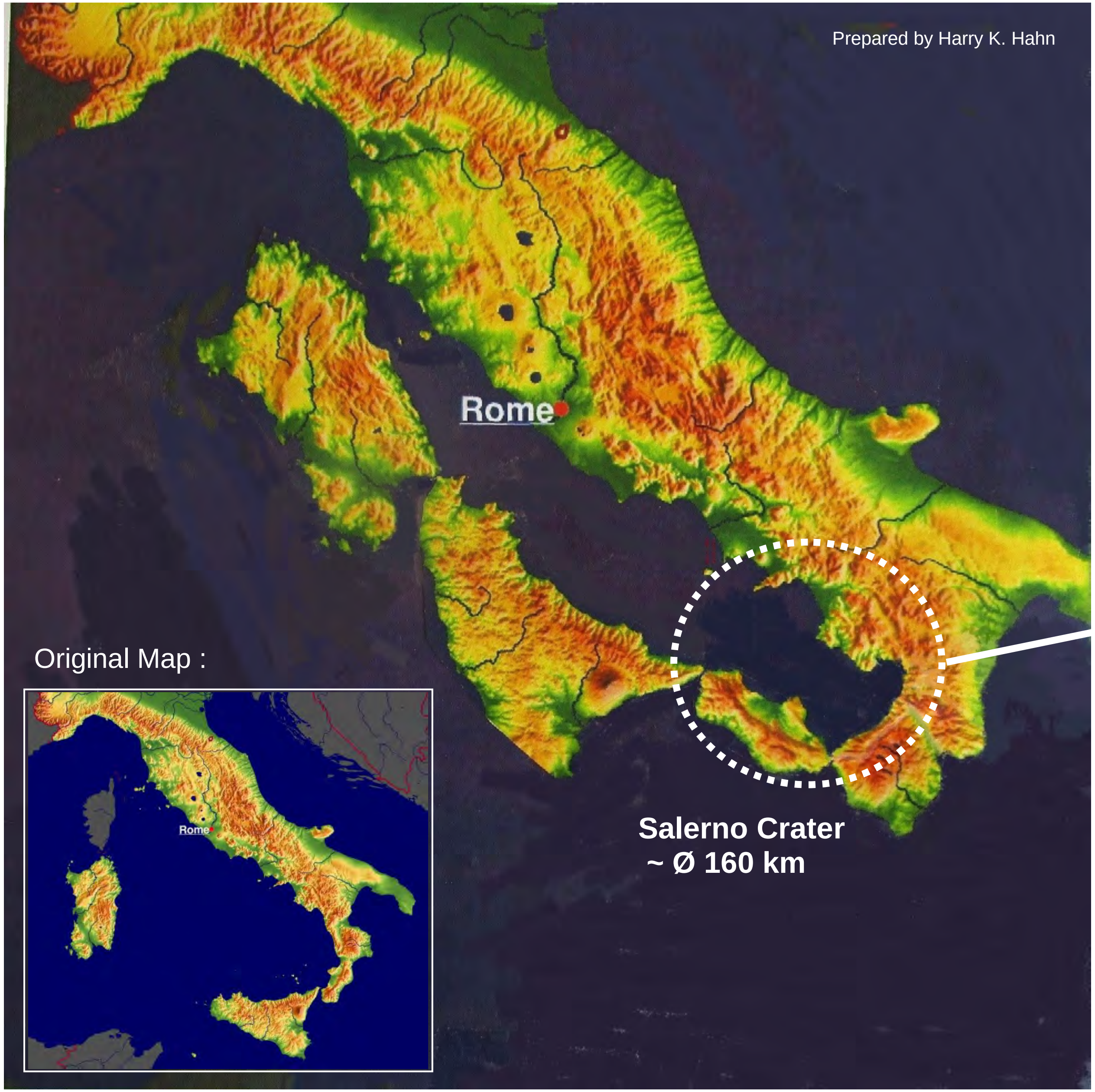


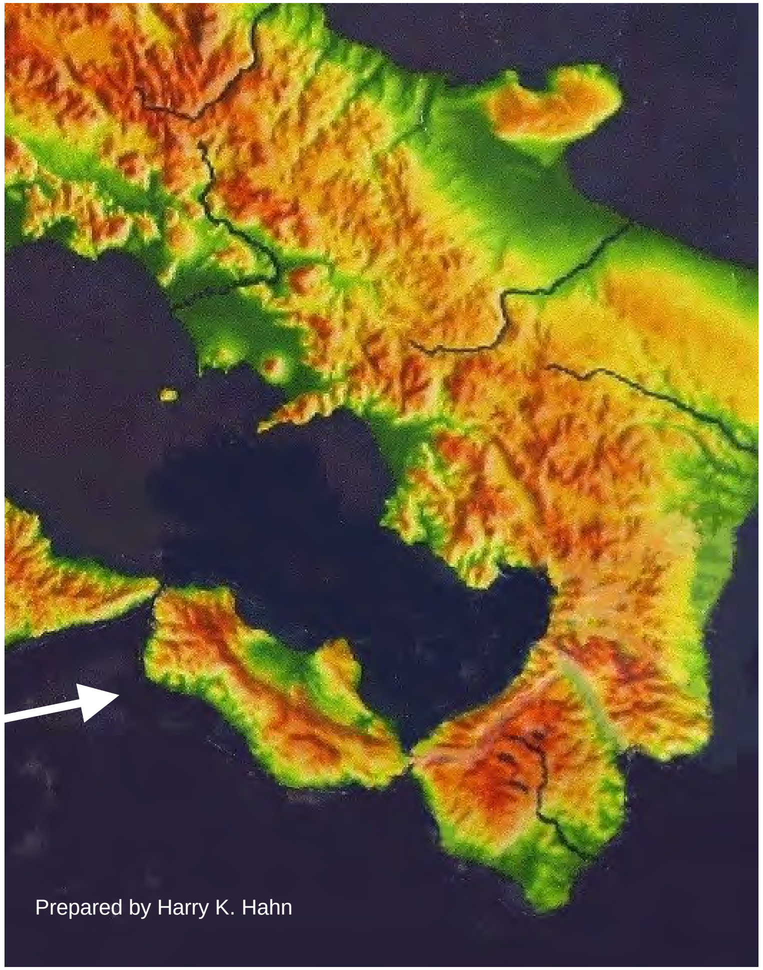
Breccia from sample site 21-B

→ **Find images of all rock samples & sample sites under :**
www.permiantriassic.at or
www.permiantriassic.de

The topographic map of Italy also provides evidence for the two described impact craters

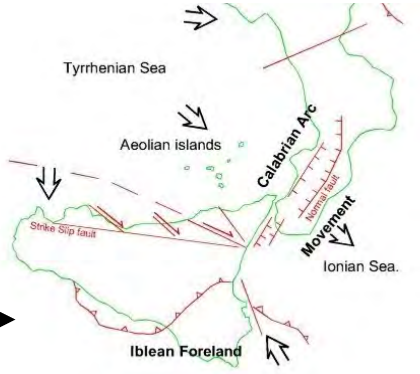
By re-arranging the different crust fragments which form Italy today, the original impact scene comes to light :





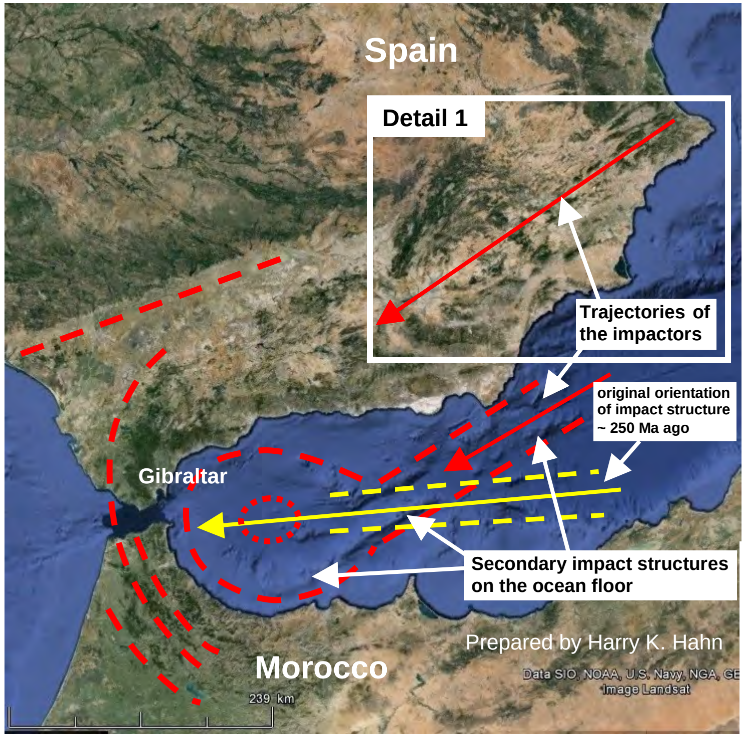
The manipulation of a topographic map of Italy and a re-arrangement of the crust fragments of Italy brings to light the original Impact Crater !

The tectonic situation near Sicily :



Further indications for a largescale impact event in Europe can be found in Spain & Portugal

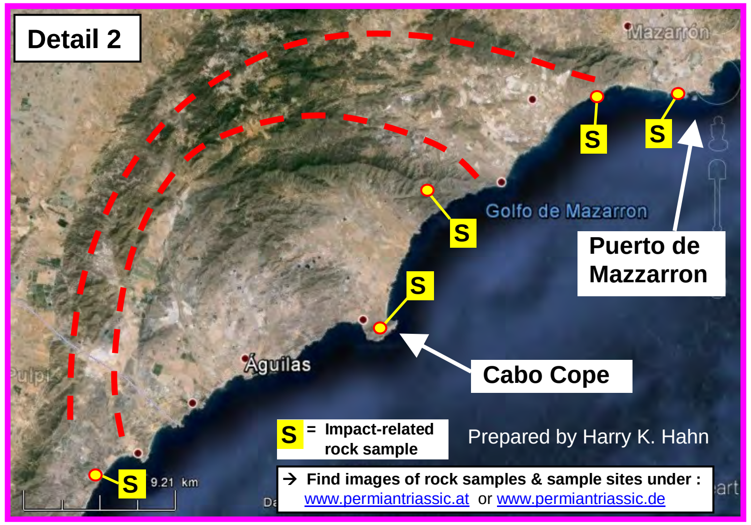
In the South and South-East of Spain, and in Morocco, there are large-scale secondary impact structures visible, which obviously were caused by the same primary impact event. This was in all probability the Permian Triassic[1] Impact Event, which happened 253 Ma ago close to the North-Pole.


Spain
Detail 1
Trajectories of the impactors
original orientation of impact structure ~ 250 Ma ago
Gibraltar
Secondary impact structures on the ocean floor
Prepared by Harry K. Hahn
Morocco
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
239 km

There are linear structures and bow-shaped structures noticeable on land and on the ocean floor between Spain and Morocco. The linear structures indicate the direction where the impactors came from, which probably was the area of the **PT**2 -Impact Crater.

The bow-shaped structures clearly indicate that the two impactors, which produced these structures, were travelling towards south-west when they impacted. The bow-shaped structures further indicate the strong compression in Earth's crust which was caused by the impacts west & south-west of the impact centers.

Because the whole area was obviously covered by flood lava directly after the impact (→ this is good visible on the 3D satellite-maps of Google Earth) only the areas which are free of flood-lava-remains will provide the impact related evidence to confirm this impact event !!



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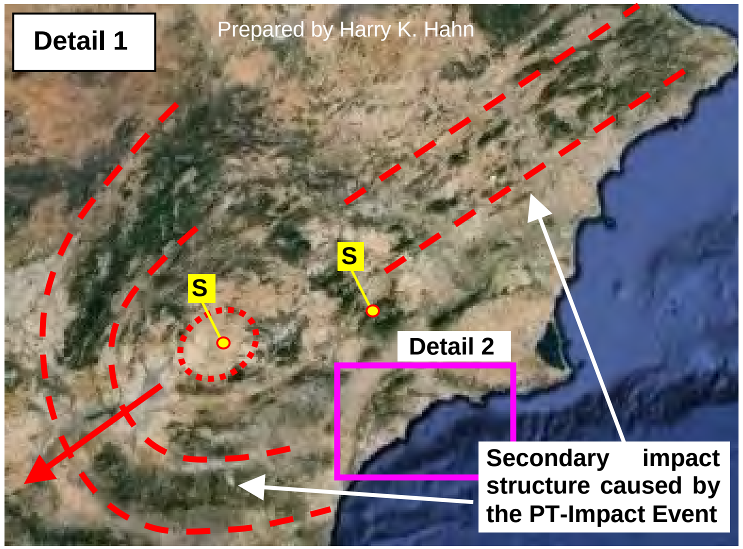

Detail 1
Prepared by Harry K. Hahn
S
S
Detail 2
Secondary impact structure caused by the PT-Impact Event

Rock samples which definitely indicate an impact event where found in the yellow marked areas shown in Detail **1** and **2** (e.g. the samples from Cabo Cope & Mazzaron) The samples show clear similarities to the samples taken in Italy. Therefore the rock samples collected near the described impact areas in Italy & Spain will confirm the evolution of Europe which I describe on the next pages :

The Rubielos Impact Structure in East-Spain :

The Rubielos Structure may be a direct result of the large secondary impacts caused by the PT-impact along the west-Coast of Spain (→ see next pages !)

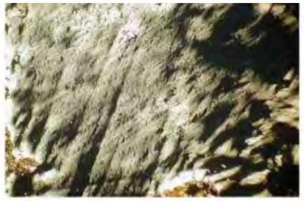
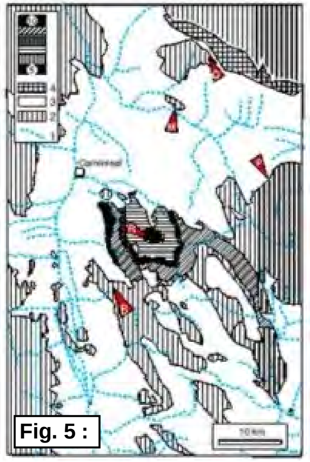


Fig.4. Diaplectic glass and multiple sets of PDFs in quartz (polymict breccia near Torrecilla; field is 400 µm wide).



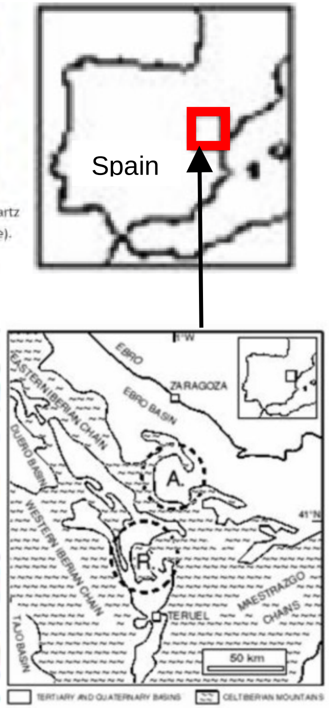
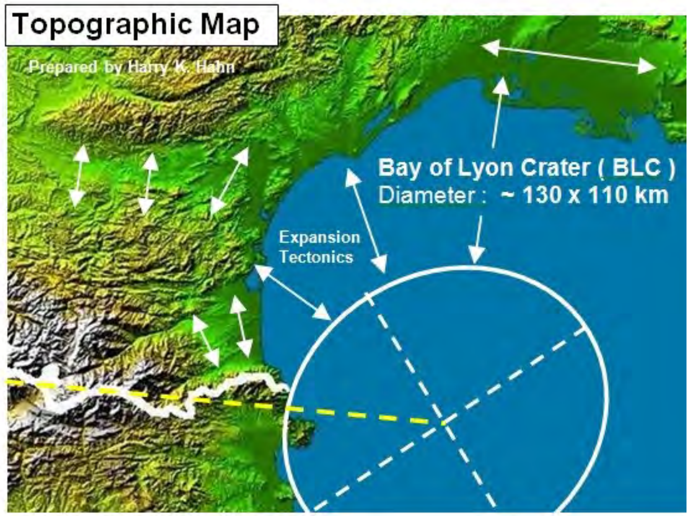


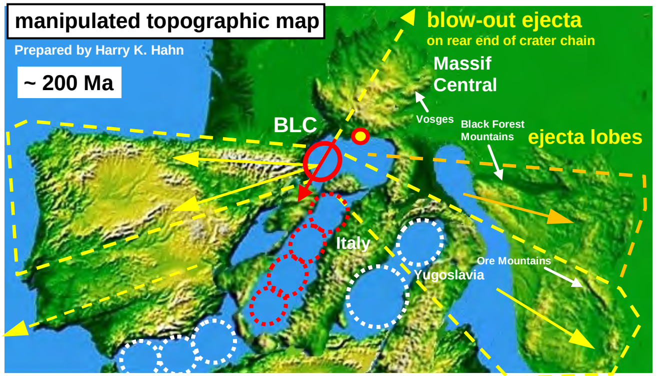
Fig.5. Sketch-map of the Rubielos de la Cérida structure. 1 drainage pattern, 2 Paleozoic, Mesozoic and Lower Tertiary rocks, 3 Upper Tertiary and Quaternary rocks, 4 Pelarda Fm. ejecta, 5-10 Muschelkalk, Keuper, Jurassic, Cretaceous in the central uplift. About 50 km south of the Azuara impact structure (35 - 40 km diameter; Fig.1) [1, 2], the Rubielos de la Cérida structure is defined by a circular to elliptical basin with a diameter of roughly 40 km, a circular central uplift with a diameter of about 15 km and a 500 m stratigraphic uplift, and a geometrically associated drainage pattern (Fig.5). The most significant feature is the enormous compressive signature in the rocks including *gries* brecciation [3] (Fig.9) and continuous megabrecciation up to chaotic criss-cross layering nearly everywhere (Fig.10, 11). Apart from the general megabrecciation, all kinds of monomict and polymict breccias (Fig.8) and breccia dikes (Fig.6) occur. - Strong evidence for an impact origin of the Rubielos de la Cérida structure is given by the find of compact melt rocks within the structure between the central uplift and the northern rim. The melt rocks (silicate, carbonate, and phosphate melt) occur as blocks of variable size intermixed in a polymict megabreccia (Fig.2, 3). A petrographic description of these melts is given in [4]. - More evidence of impact signature in rocks from the Rubielos de la Cérida structure is given by the occurrence of shock metamorphism. We observe heavily disintegrated feldspars with strong mechanical twinning and multiple sets of PDFs, crossing sets of isotropic lamellae in twinned feldspars, diaplectic quartz and feldspar together with multiple sets of PDFs (Fig.4). Kinkbanding in mica from silicate Createceous rocks and strong microtwinning in calcite are frequently observed. As a macroscopic shock feature,

There is an oblique impact crater with Ø 130 x 110 km located in the Gulf (Bay) of Lyon, caused by the PT- Impact Event

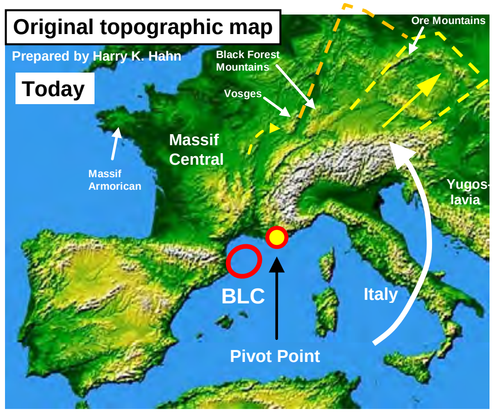

Topographic Map
Prepared by Harry K. Hahn
Bay of Lyon Crater (BLC)
Diameter : ~ 130 x 110 km
Expansion
Tectonics

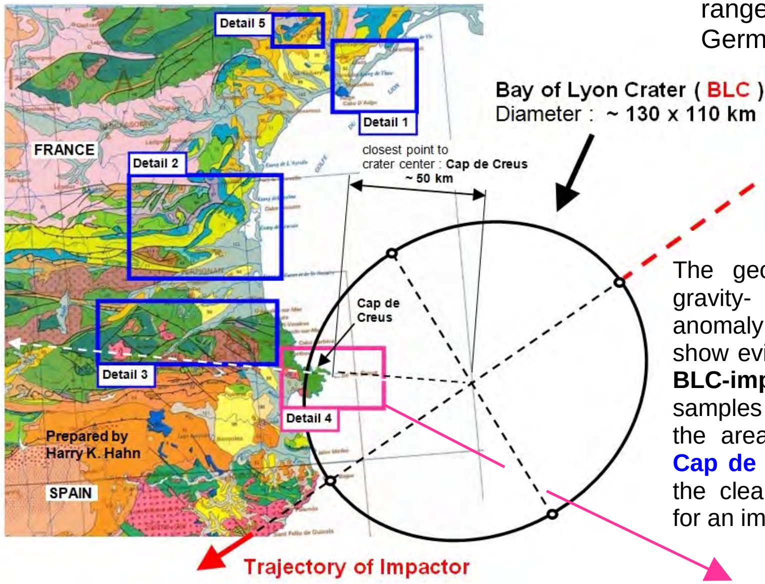
The ejecta structures of the **Bay of Lyon Crater** and of other craters from the secondary crater chain caused by the PT-I are easier to notice when we turn back the time and show Europe as it looked around 200 Ma (million years) ago. The manipulated topographic map on the right side shows ejecta structures of the **BLC** on their original location. For example the Massif Central & other mountain ranges (ejecta) in Poland Germany & Hungary etc.

The **Bay of Lyon Crater (BLC)** is the last crater of an impact crater chain caused by ejecta of the **Permian Triassic Impact Event**. Because of its location on the northern end of this crater chain, there are still ejecta structures visible today. For example **blow-out ejecta** from the rear end of the crater chain (from the BLC) which is the Massif Central Mountain Range & ejecta lobe structures.

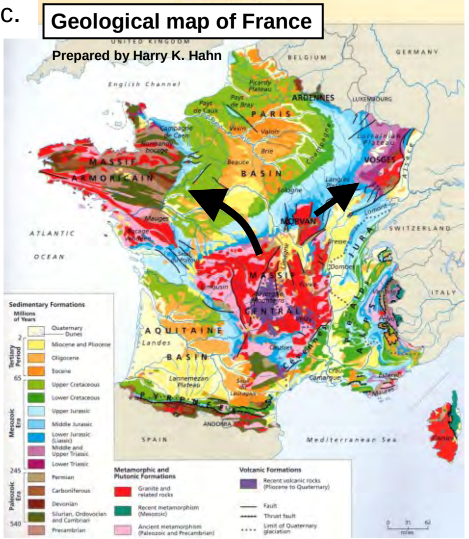


Europe around 200 Ma ago. Italy has just began to rotate around the **BLC**
(→ rotation of Italy & Yugoslavia around the indicated pivot point)



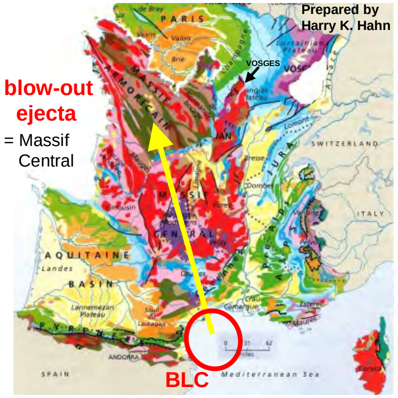


The geological map, gravity- & magnetic anomaly maps all show evidence for the **BLC-impact.** Rock samples were taken in the areas Detail 1-5. **Cap de Creus** shows the clearest evidence for an impact event.



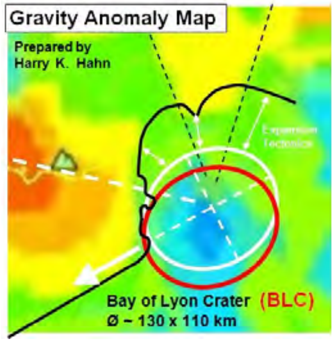
manipulated geological map :

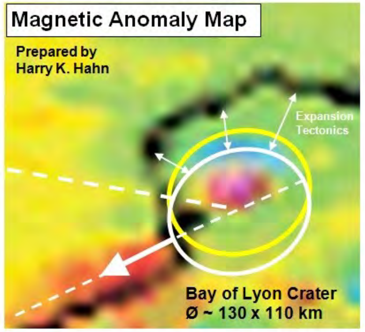
This manipulated geological map shows the original orientation of the ejecta (the Massif Armoricain & the Vosges in relation to the Massif Central)

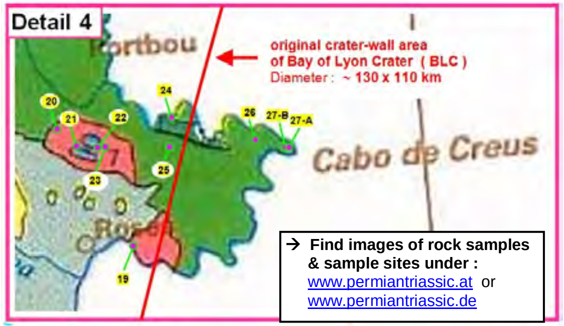


Germany / Karlsruhe area :

The Black Forest region just south of Karlsruhe & the Ore Mountains are also part of the **BLC-ejecta** .






Detail 4
Portbou
original crater-wall area
of Bay of Lyon Crater (BLC)
Diameter : ~ 130 x 110 km
20
21
22
23
24
25
26
27-B
27-A
19
Cabo de Creus

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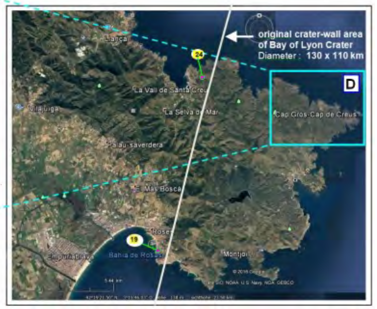
Detail 4 : shows the sample sides 19 to 27 near **Cap de Creus**



The sample sides No 27-A and 27-B near Cap de Creus show the clearest evidence for an impact event.

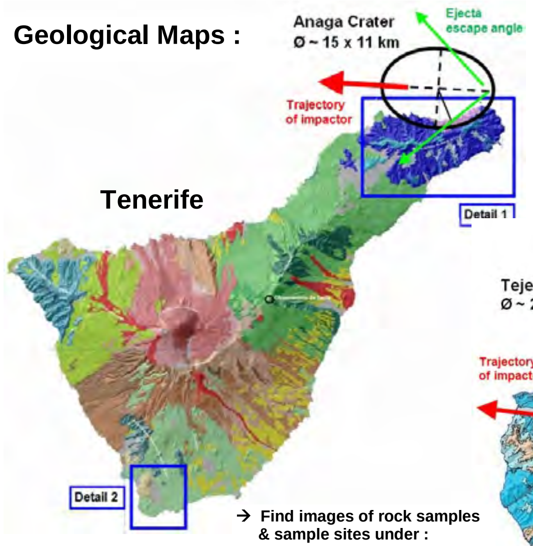
→ **See Detail D**

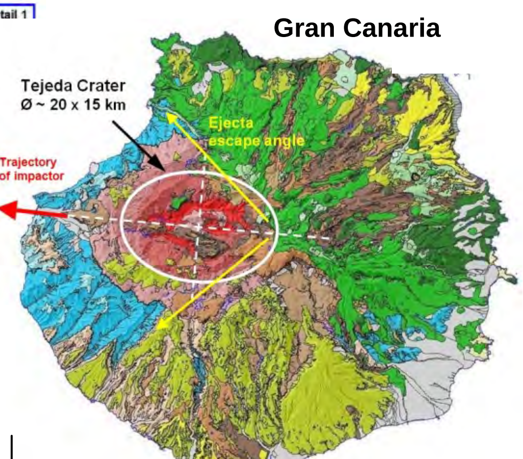
sample side 24 just left of Detail D also shows proof.

Two oblique impact craters Ø 20x15 km & Ø 15x11 km on the Canary Islands (Spain)

The Canary Islands **Tenerife & Gran Canaria** show evidence for two oblique impact craters (Ø 20x15 km & Ø 15x11 km) which were caused by impactors (ejecta) ejected from a much larger crater. This larger crater was a secondary crater which was produced by the Permian Triassic (PT)-Impact Event. **The "bases"** of the Canary Islands **Tenerifa & Gran Canaria** (& all other islands of this island-chain) were part of the crater-wall of this ~ Ø 280 x 200 km secondary crater ~ 253 Ma ago, before they slowly drifted away in a SW-direction from the location of the initial ~Ø 280 x 200 km crater. Gravity Anomaly- & Magnetic Anomaly Maps provide the evidence

Geological Maps :





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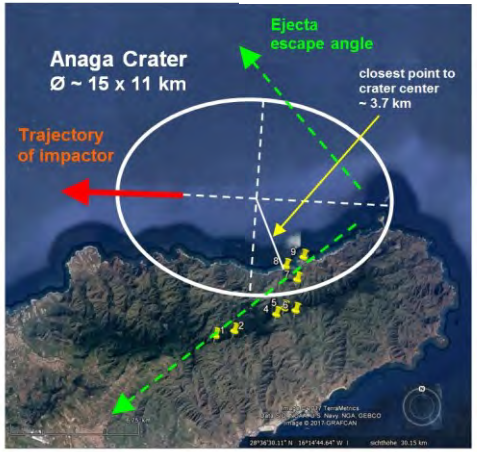
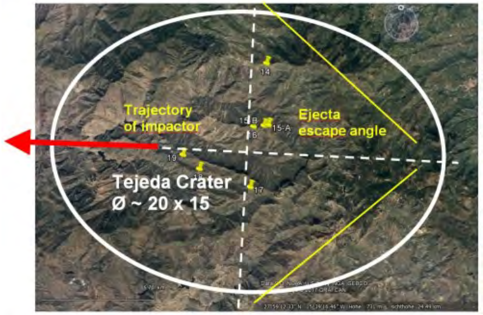
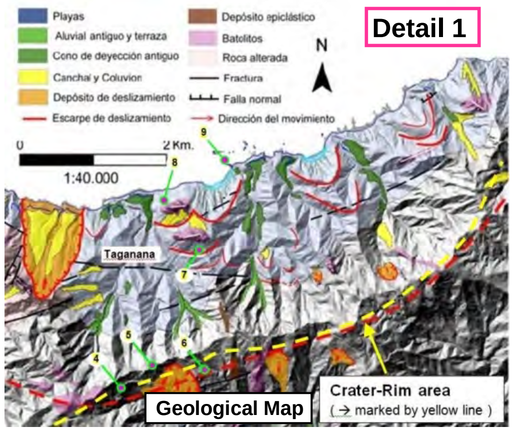
Satellite Image :

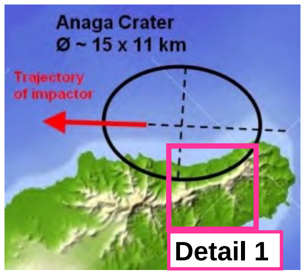

Ejecta escape angle
Anaga Crater
Ø ~ 15 x 11 km
closest point to crater center ~ 3.7 km
Trajectory of impactor
8
9
7
6
4
5
2
Image © 2017 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2017 GRAFCAN
28°36'30.11" N 16°14'44.64" W
sichthöhe 30.15 km

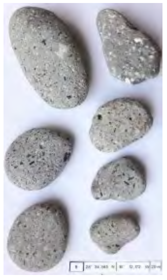
Satellite Image :

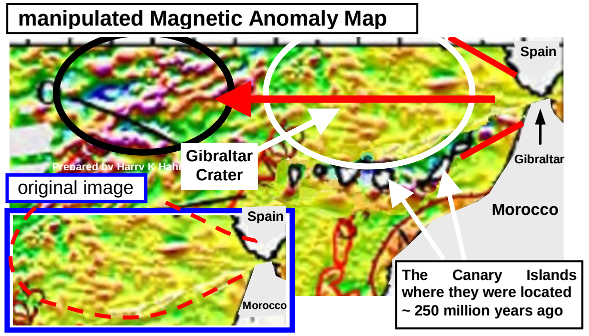




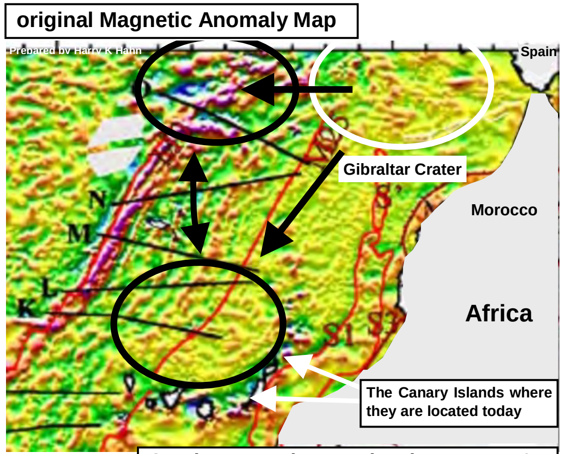
The two impact craters **Anaga Crater** ~15 x 11 km & **Tejeda Crater** ~20 x 15km have the **same orientation** ! Sample sites **No. 7 & 9** provide proof for the impact event. These sites contain **Suevite** !



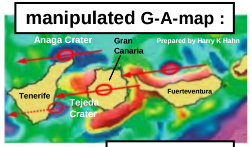


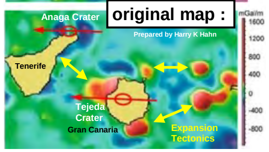

manipulated Magnetic Anomaly Map
Spain
Gibraltar
Gibraltar Crater
Prepared by Harry K Hahn
original image
Spain
Morocco
Morocco
The Canary Islands where they were located ~ 250 million years ago

The Magnetic Anomaly Map of the ocean floor west & south-west of Gibraltar shows the clearest traces of the impact event which happend ~253 Ma ago.
→ **see original map on right side** (original image)


original Magnetic Anomaly Map
Prepared by Harry K Hahn
Spain
Gibraltar Crater
Morocco
N
M
L
K
S1
Africa
The Canary Islands where they are located today

The area marked by a white ellipse, size: ~Ø 430 x 290 km is the remaining **magnetic signature** of the original crater (→**Gibraltar Crater**). The black ellipses mark **two "drift-off copies"** of this signature in different crust-layers, caused by ocean floor spreading. The **manipulated Map** (left) shows the Canary-Islands on their original position ~ 250 Ma ago.





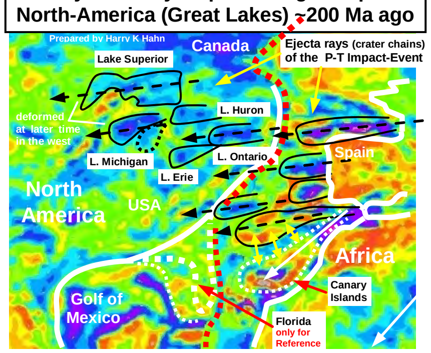
Analysis of Gravity Anomaly (G-A) Maps :

Magnetic anomaly maps, topographic maps and Gravity Anomaly maps show that the Canary Islands were part of the **southern crater-wall** of a **crater at the end of the R1-crater-chain** caused by the **PTI-event**. The gravity anomaly map on the left indicates that the Canary Island-Bases were initially close together & that they were hit by ejecta (impactors) coming from the same direction

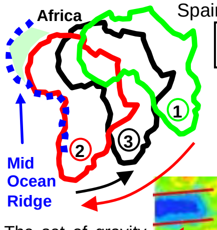
The Great Lakes (USA) were formed by ejecta :

The map on the right side shows a Gravity Anomaly Map of Europe, Africa & North-America (without the Appalachians), ~200 Ma ago. The Great Lakes were caused by ejecta from the PTI-event (→R1)

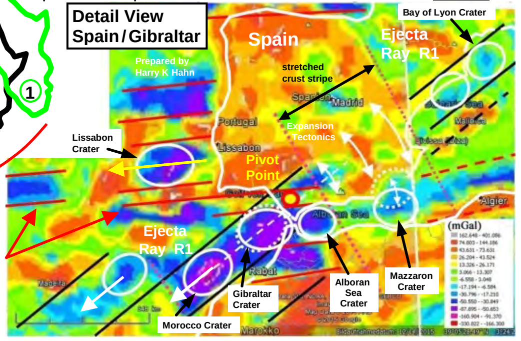
Gravity Anomaly Map showing Europe & North-America (Great Lakes) ~200 Ma ago



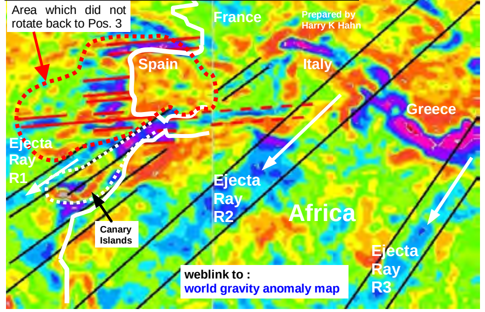
The rotation of Africa caused a 30° rotation of Spain in relation to Africa : The **Ejecta Rays R1 to R4**, caused by the **PTI-event** accelerated the African Plate towards the SW. From its original **position 1** (green), the African Plate rotated clockwise essentially around a pivot point close to Gibraltar to the later **position 2** (red), from which it then rotated back to the current **position 3** (black). However Spain and a part of the new Atlantic Ocean Floor did not rotate back from **Pos. 2 to 3**. This is indicated by the G-A map



The set of gravity anomalies marked by the **red lines** indicates the crust area which did not rotate back to 3.



Gravity Anomaly Map of Europe & Africa

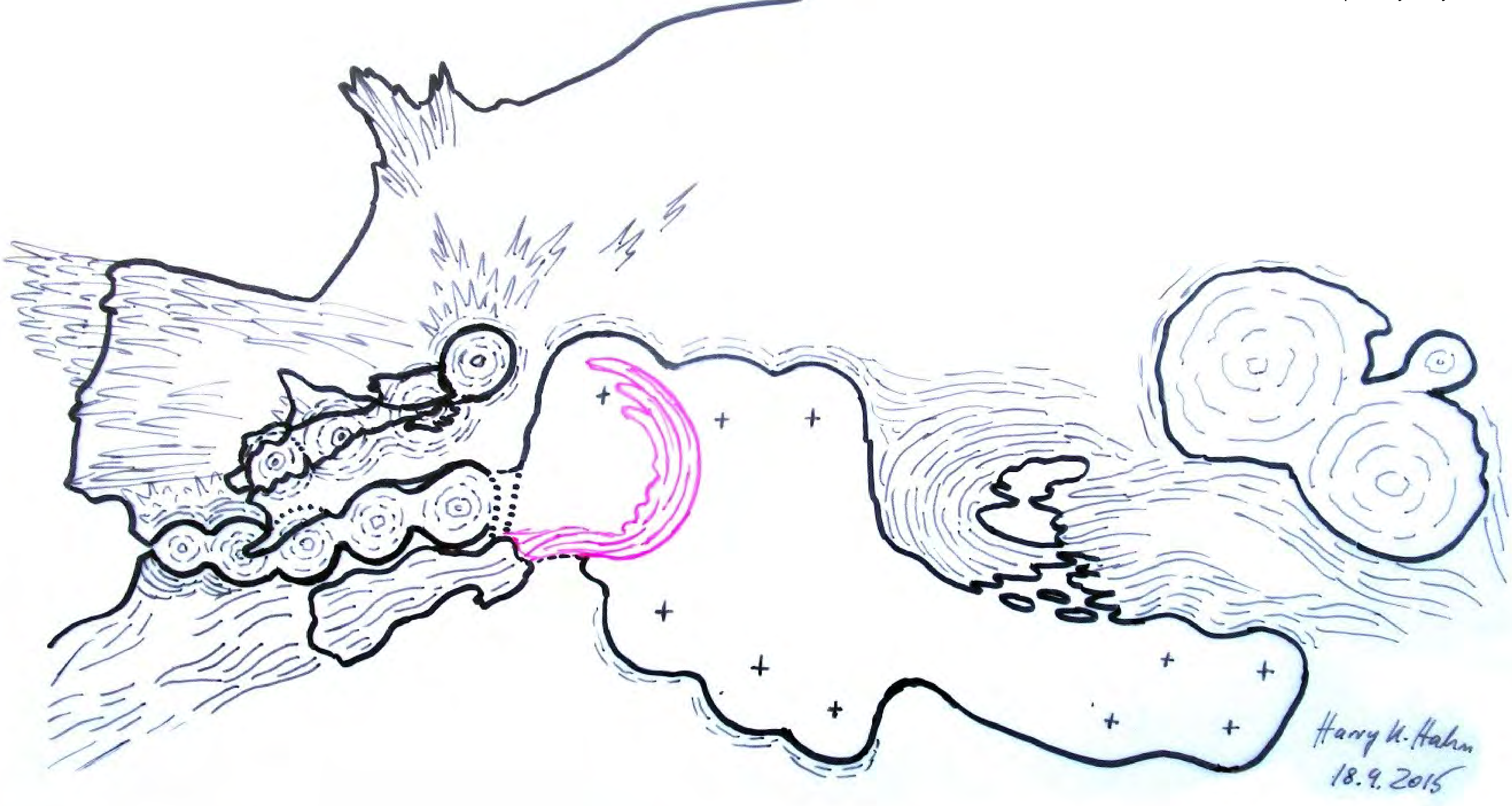


weblink to :
world gravity anomaly map

The evolution of Europe : It started with the impact of the ejecta from the PT-Impact around 253 Ma ago

The following drawing shows what happened around 253 Ma ago when the ejecta from the PT$_2$-Impact near the north-pole impacted in the European Region. At that time whole Europe was an impact area which was hit by at least a dozen large impactors with diameters in the range of 5 to 20 km, which produced a series of craters which fractured Earths crust and formed several crust fragments. Because of an opening-up of the mediterranean area, caused by the PT$_3$-Impact itself and the impact of the ejecta, a large vortex was triggered (marked with purple lines) which probably reach down > 100 km to the Asthenosphere. This vortex then caused the further evolution of Europe. → see next pages !

Prepared by Harry K. Hahn



Harry K. Hahn
18.9.2015

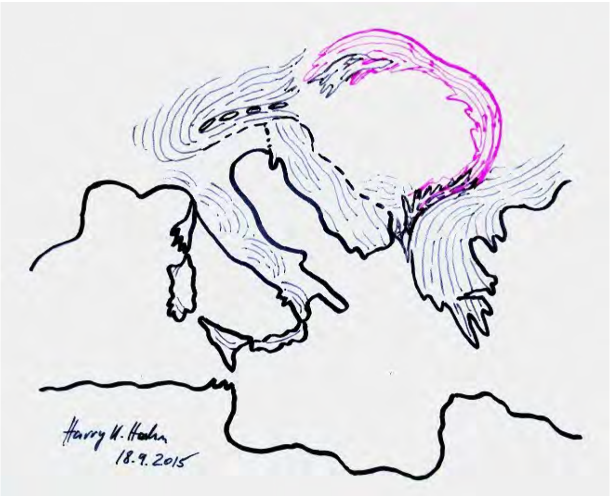
→ **Note : Scroll up & down the next three pages quickly to see an animation of the tectonic evolution of Europe !!!**

The flow of mantle material in the vortex then moved Italy slowly towards East

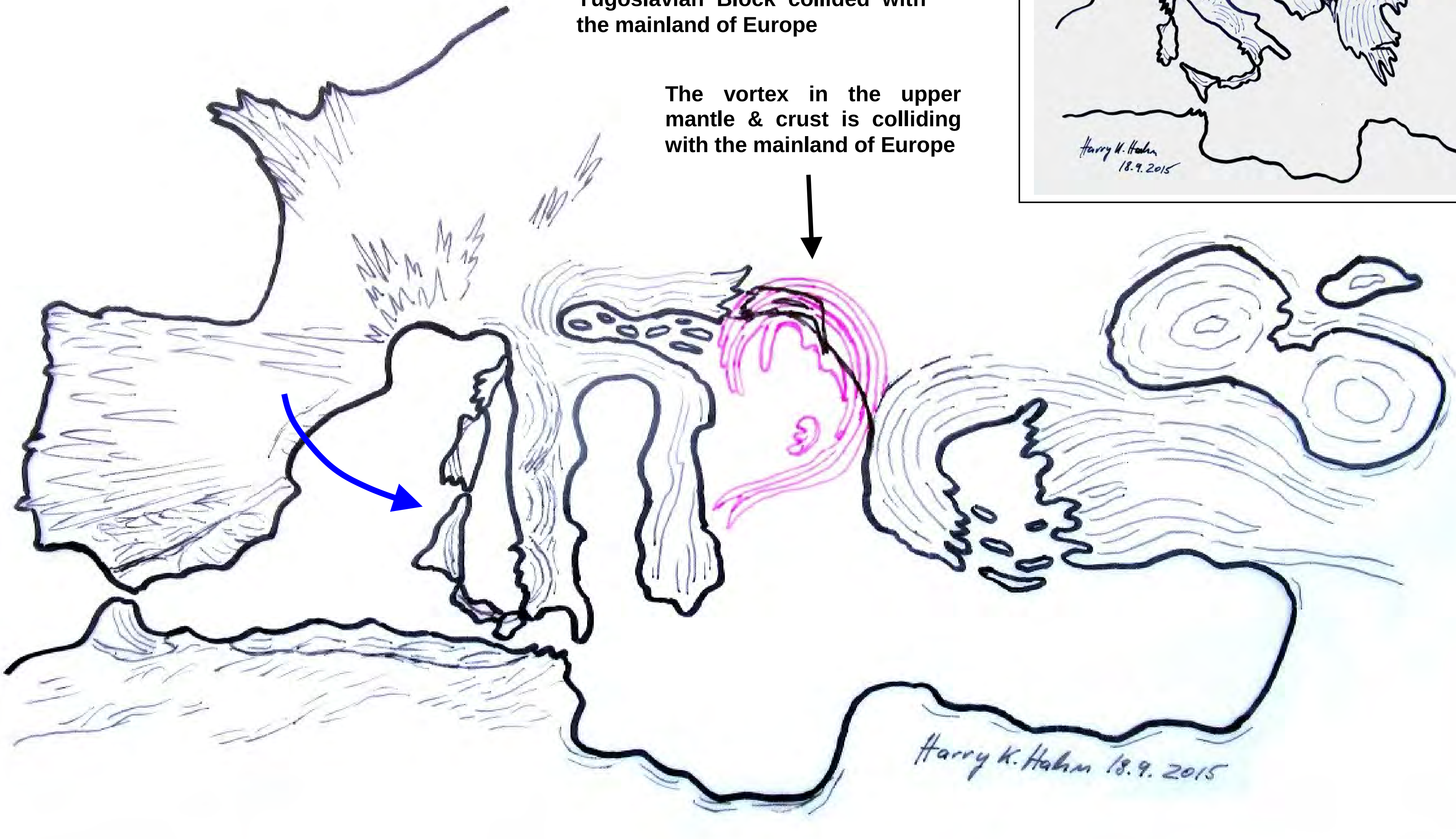
The resulting rotary movement of Italy around its last fixing point with the main land Europe, caused by the vortex in the upper mantle & crust, started to form the Alps :

Prepared by Harry K. Hahn

The tectonic situation when the Yugoslavian Block collided with the mainland of Europe

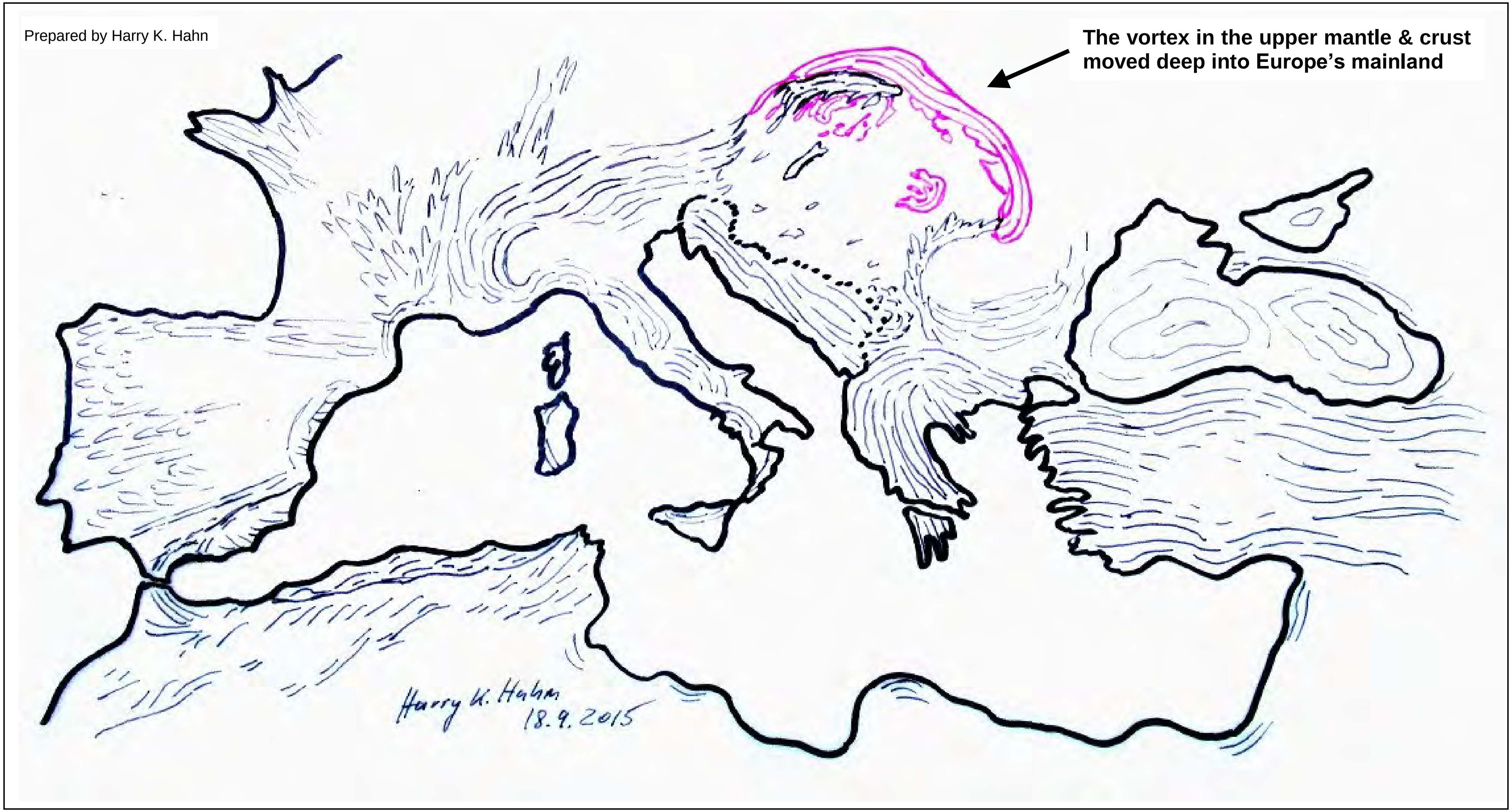


The vortex in the upper mantle & crust is colliding with the mainland of Europe



Here now the present appearance of Europe today, 253 Ma years after the impact of the ejecta from the PT-Impact

The continuous rotatory movement of Italy around its fixing point has produced the Alps and other mountain ranges in Europe.


Prepared by Harry K. Hahn

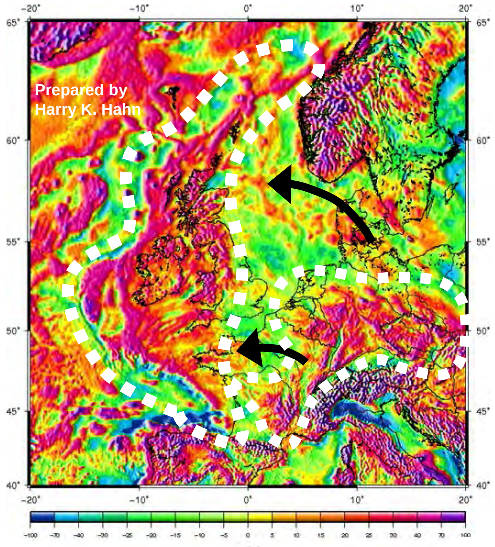
The vortex in the upper mantle & crust moved deep into Europe's mainland

Harry K. Hahn 18.9.2015

➔ Note : Scroll up & down the last three pages quickly to see an animation of the tectonic evolution of Europe !!!

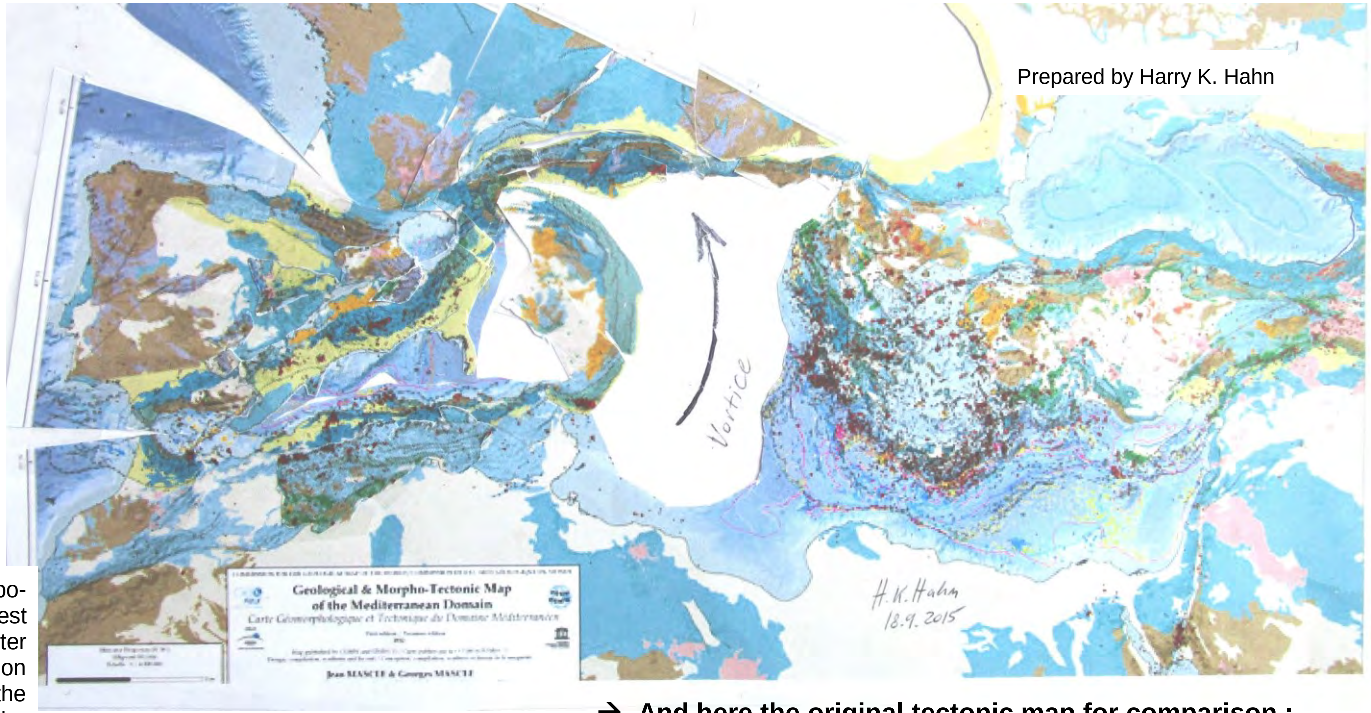
Further indication for the impact-related evolution of Europe is visible on different maps :

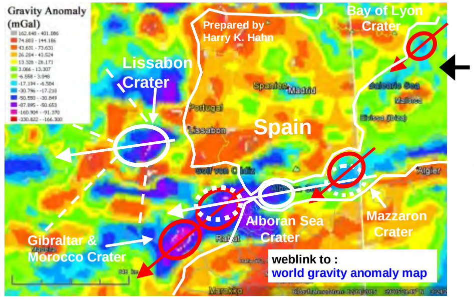
The magnetic anomaly map of Northern Europe indicates the rotation of an enormous mass stream (vortex) in an anti-clockwise direction !



The Magnetic Anomaly map shows that a large area which contains magnetic material (→ high mGal values) rotated in an anti-clockwise direction around a point which is located approximately in the gulf (bay) of Lyon. It seems that this area broke away from the area with magnetic material located around the Alps.

This is the tectonic map of Europe which I used to move the crust fragments, caused by the impacting ejecta of the PT-Impact, back to their original position. For this I used the different coloring of the assumed fragments as a reference to move them back to their correct positions (at the time of the impact event). It is not 100% precise. But I believe it shows the situation some time after the impact event quite good (at least in the west of Europe).

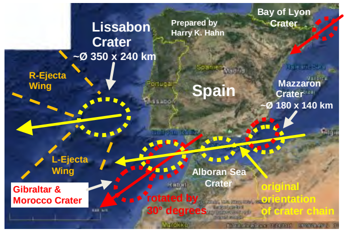

Prepared by Harry K. Hahn
Vortice
Geological & Morpho-Tectonic Map of the Mediterranean Domain
Carte Géomorphologique et Tectonique du Domaine Méditerranéen
Jean MASCLE & Georges MASCLE
H. K. Hahn
18.9.2015



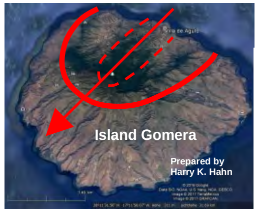
weblink to :
world gravity anomaly map

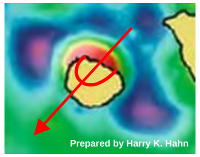
Gravity Anomaly Map South-West Europe

The gravity anomaly & topo-graphic map of South-West Europe show clear impact crater structures which are located on the ocean floor. Because of the orientation and because of the elliptical shape of these impact craters, it can be concluded that these craters are secondary craters, caused by ejecta from the PT-Impact. The largest of the three elliptical craters, offshore of Portugal measures 350 x 240 km (**Lissabon Crater**). The other two craters are ~ 280 x 200 km each (**Gibraltar & Morocco Crater**). In the crater areas large oil- and gas-fields should exist !!

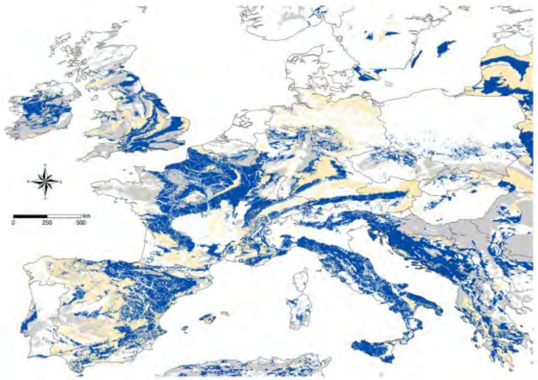


Evidence of an oblique Impact on Gomera :





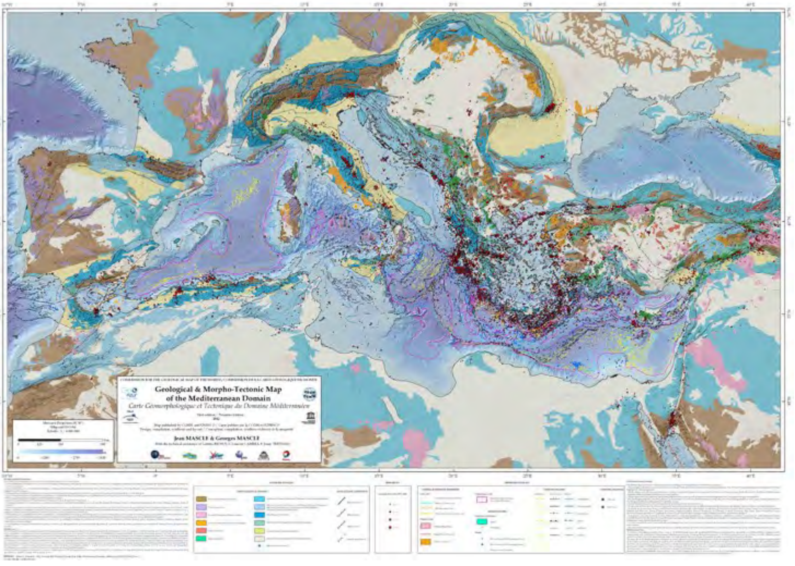
The Canary Island Gomera also shows evidence of an oblique impact crater. Similar to Tenerife the Island Gomera was hit by ejecta from the Gibraltar Crater. The topography of the crater center provides first evidence for this hypothesis.



The distribution of carbonate rocks seems to be related to the assumend impact event in Europe

→ there seems to be a correlation of the distribution of the carbonate rocks with the distribution of the ejecta material of the impact event in Europe

→ And here the original tectonic map for comparison :

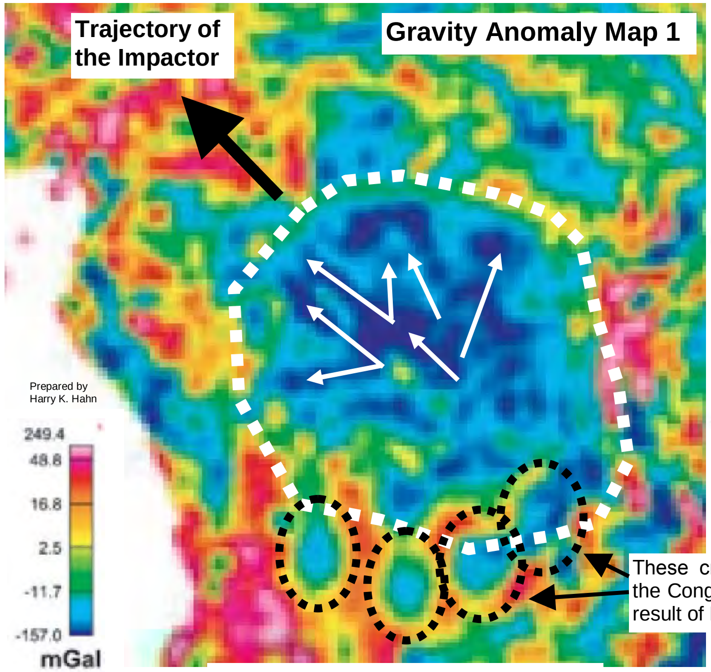

Geological & Morpho-Tectonic Map of the Mediterranean Domain
Carte Géomorphologique et Tectonique du Domaine Méditerranéen
Jean MASCLE & Georges MASCLE

4 A multiple Impact Crater with the dimensions 1200 x 850 km has caused the Congo Basin < 200 Ma ago

The gravity anomaly map of Africa shows a large 1200 x 850 km multiple impact structure in the center of the Congo Basin.

Prepared by Harry K. Hahn

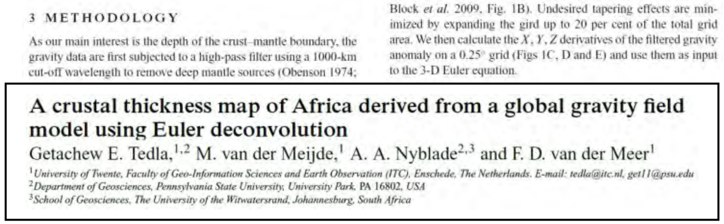
The map (→ **an Eigen-GL04C free-air gravity anomaly map**) clearly shows the complex structure of the impact crater which probably was formed by a large asteroid or comet which broke into pieces just before impact. Because of the assumed trajectory & age of the impactor, this impact crater doesn't seem to be related to the PT2 Impact. There are also other impact structures visible on this maps which must be caused by ejecta rays of the PT-Impact



These craters probably don't belong to the Congo Impact. They are probably the result of PTI-Ejecta Rays.

(A) EIGEN-GL04C free-air anomaly,

→ **Eigen-GL04C free-air gravity anomaly map**



3 METHODOLOGY

As our main interest is the depth of the crust–mantle boundary, the gravity data are first subjected to a high-pass filter using a 1000-km cut-off wavelength to remove deep mantle sources (Obenson 1974; Block *et al.* 2009, Fig. 1B). Undesired tapering effects are minimized by expanding the gird up to 20 per cent of the total grid area. We then calculate the *X*, *Y*, *Z* derivatives of the filtered gravity anomaly on a 0.25° grid (Figs 1C, D and E) and use them as input to the 3-D Euler equation.

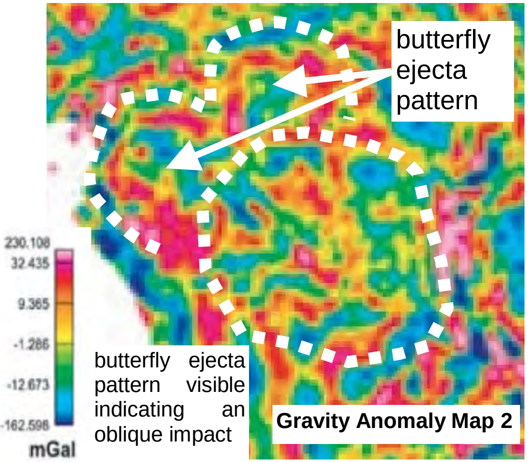
A crustal thickness map of Africa derived from a global gravity field model using Euler deconvolution

Getachew E. Tedla,[1,2] M. van der Meijde,[1] A. A. Nyblade[2,3] and F. D. van der Meer[1]

[1] *University of Twente, Faculty of Geo-Information Sciences and Earth Observation (ITC), Enschede, The Netherlands. E-mail: tedla@itc.nl, get11@psu.edu*
[2] *Department of Geosciences, Pennsylvania State University, University Park, PA 16802, USA*
[3] *School of Geosciences, The University of the Witwatersrand, Johannesburg, South Africa*

This largescale impact structure, which is probably independent from the PT-Impact, may have caused the final break-up of Gondwana. The impulse of the impact was immense and surely was transferred from the African Plate in the South-American- & North-American-Plate, which then moved away from the African Plate with considerable speed Under this consideration the impact maybe 150-180 Ma old.

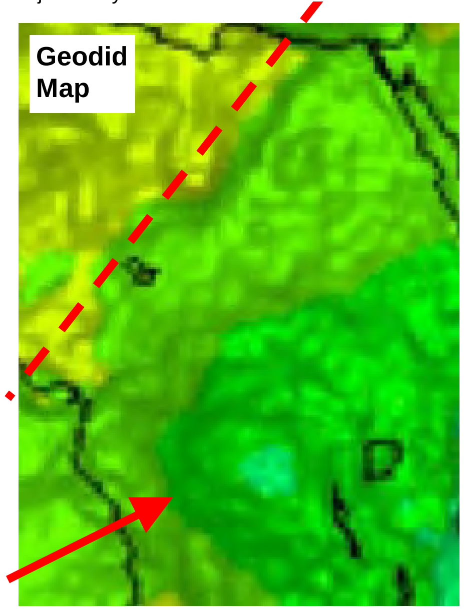
Congo Impact & Butterfly Ejecta pattern visible on Godid Map

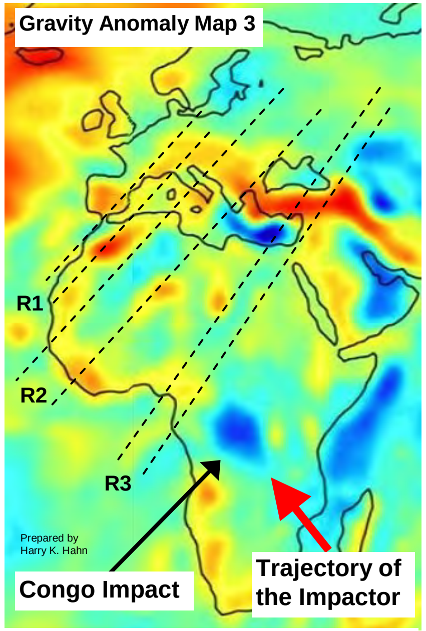


butterfly ejecta pattern visible indicating an oblique impact

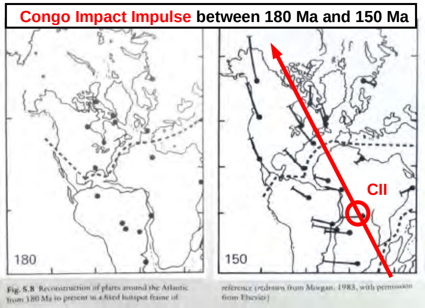
(B) High-pass filtered gravity anomaly map

Linear structure from the ejecta ray R3 of the PT-Impact Event





The two images on the righthand side show the other impact structures on the gravity anomaly map, which are independent from the Congo Impact. The bottom Map was rotated a bit to make the impact structures clearer. The impact crater chains R1 to R4 in all probability are caused by the Permian-Triassic Impact. Therefore the indicated craters with Ø150-250 km, must be secondary craters which are caused by ejecta from the **PTI.** In the crater areas many oil/gas-fields must exist.

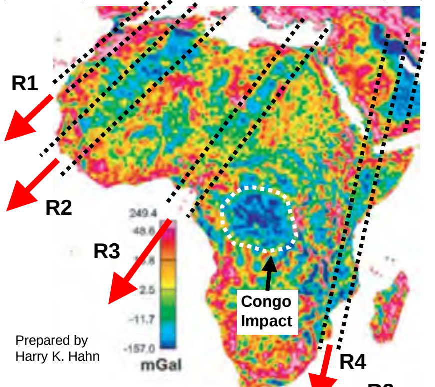


Congo Impact Impulse between 180 Ma and 150 Ma

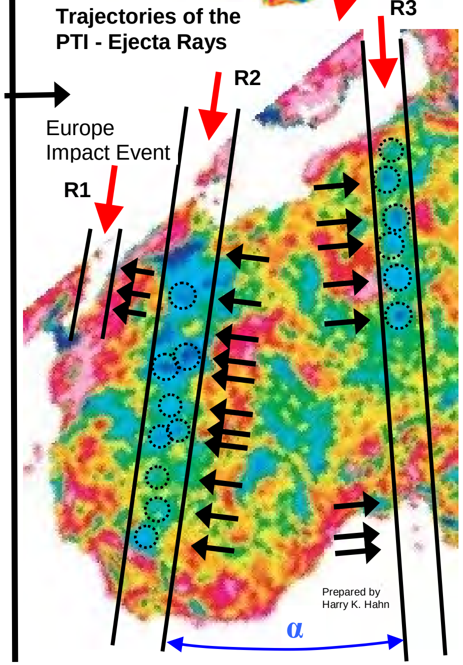
Fig. 5.8 Reconstruction of plates around the Atlantic from 180 Ma to present in a fixed hotspot frame of reference (redrawn from Morgan, 1983, with permission from Elsevier)

Other Impact Structures in Africa

There are four impact crater chains R1 to R4 visible on the gravity anomaly map of Africa, which must be caused by ejecta from the PT-Impact. The rays all meet in the center of the PTI-Crater !
(considering that Africa has rotated clockwise 5-10 degrees)



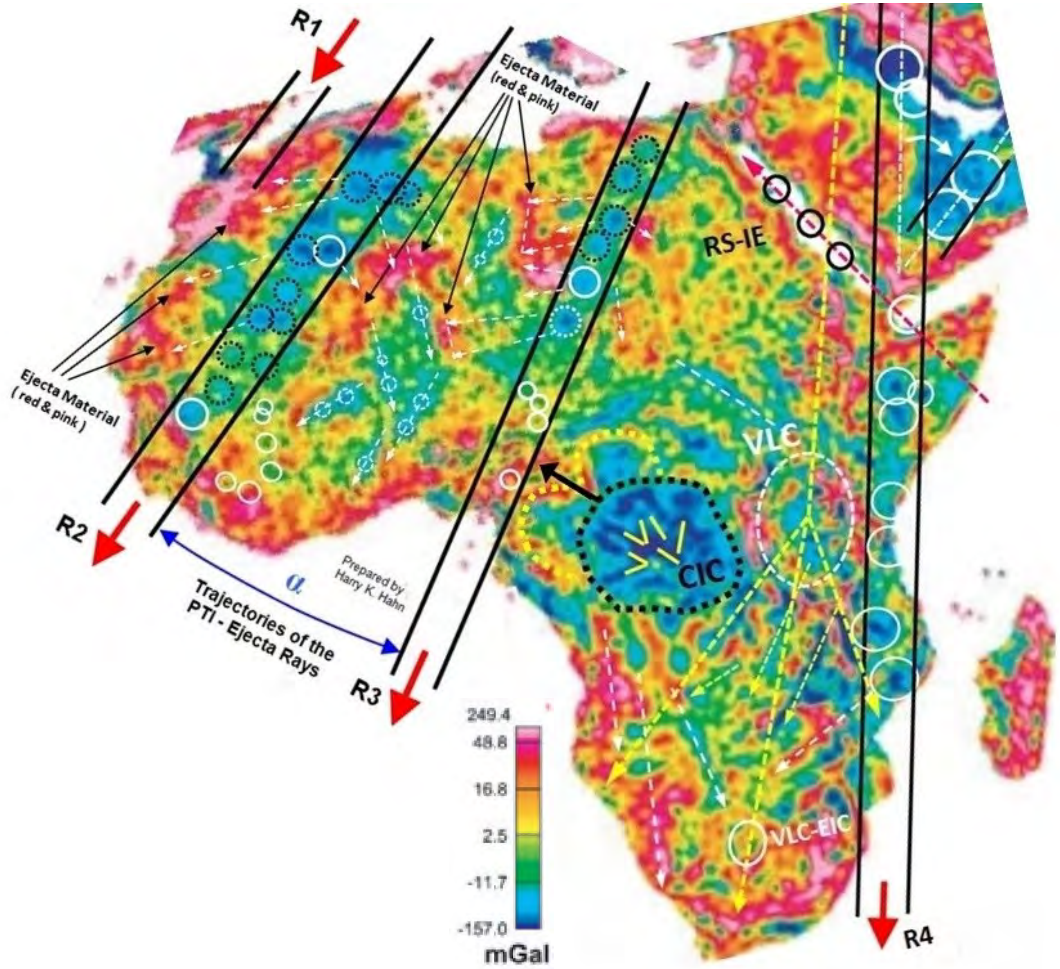
Trajectories of the PTI - Ejecta Rays

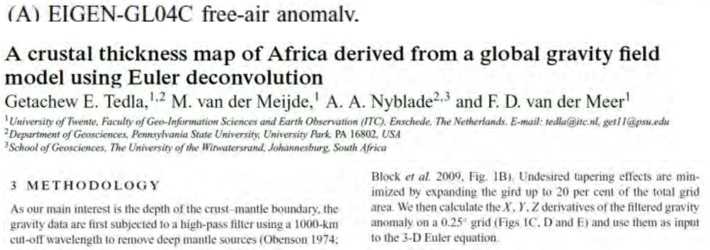


4a-1

Gravity Anomaly Map of Africa :

- ➔ Ejecta Rays R1 to R4 of the Permian Triassic impact (PTI) are marked on the map. (→ smaller crater chains are also indicated)
- ➔ Impact Craters appear as negative anomalies (blue or green areas)
- ➔ Congo Impact Crater (**CIC**) also shown on the map


R1
Ejecta Material (red & pink)
Ejecta Material (red & pink)
RS-IE
VLC
CIC
VLC-EIC
R2
R3
R4
α
Trajectories of the PTI - Ejecta Rays
Prepared by Hary K. Hahn
249.4
48.8
16.8
2.5
-11.7
-157.0
mGal



(A) EIGEN-GL04C free-air anomaly.

A crustal thickness map of Africa derived from a global gravity field model using Euler deconvolution

Getachew E. Tedla,[1,2] M. van der Meijde,[1] A. A. Nyblade[2,3] and F. D. van der Meer[1]

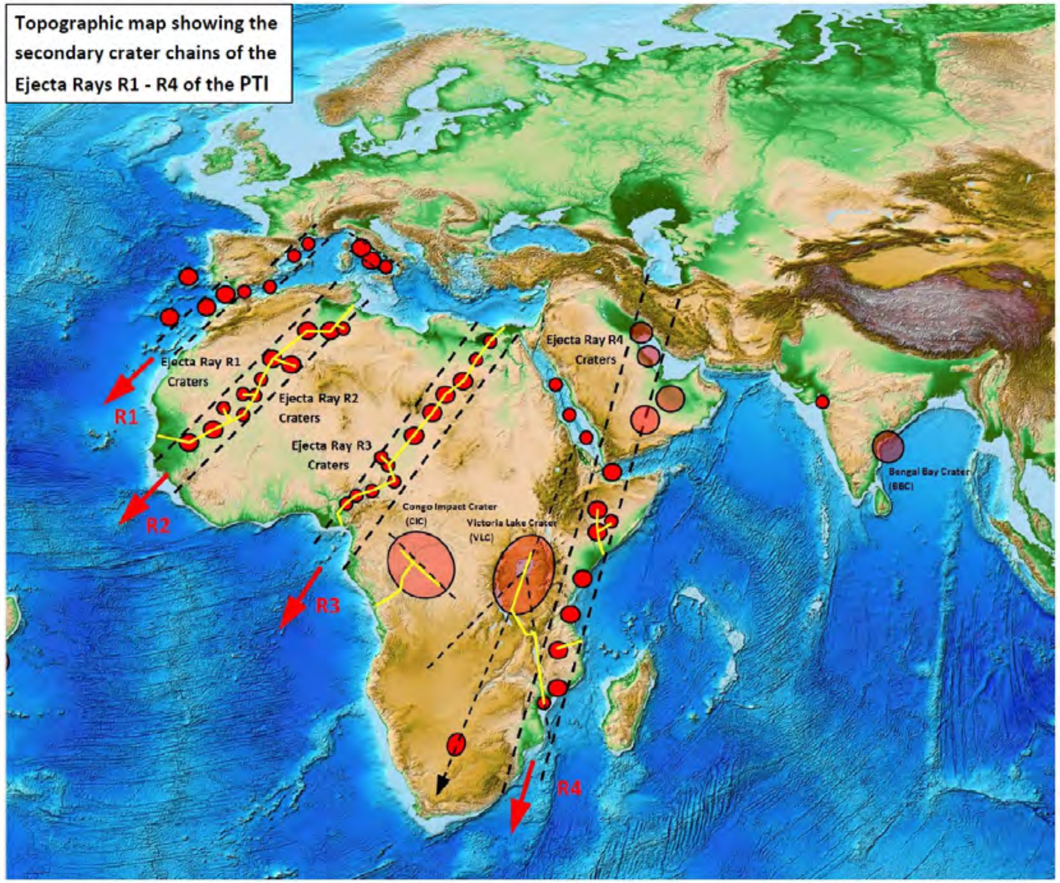
[1] *University of Twente, Faculty of Geo-Information Sciences and Earth Observation (ITC), Enschede, The Netherlands. E-mail: tedla@itc.nl, get11@psu.edu*
[2] *Department of Geosciences, Pennsylvania State University, University Park, PA 16802, USA*
[3] *School of Geosciences, The University of the Witwatersrand, Johannesburg, South Africa*

3 METHODOLOGY

As our main interest is the depth of the crust–mantle boundary, the gravity data are first subjected to a high-pass filter using a 1000-km cut-off wavelength to remove deep mantle sources (Obenson 1974; Block *et al.* 2009, Fig. 1B). Undesired tapering effects are minimized by expanding the gird up to 20 per cent of the total grid area. We then calculate the X, Y, Z derivatives of the filtered gravity anomaly on a 0.25° grid (Figs 1C, D and E) and use them as input to the 3-D Euler equation.

Topographic Map of Africa indicating the crater chains R1 to R4 :

- ➔ The Chains of impact craters (R1 to R4) shown on the topographic map (→ marked in red) in all probability represent oil- & gas-rich areas.
- ➔ The Impact Crater areas can easily be connected by a major oil-pipline which leads to sea ports for oil-tankers. → Piplines marked in yellow
- ➔ The Congo Impact Crater (**CIC**) and the Victoria Lake Impact Crater (**VLC**) also represent oil- & gas-rich areas.


Topographic map showing the secondary crater chains of the Ejecta Rays R1 - R4 of the PTI
Ejecta Ray R1 Craters
Ejecta Ray R2 Craters
Ejecta Ray R3 Craters
Ejecta Ray R4 Craters
Congo Impact Crater (CIC)
Victoria Lake Crater (VLC)
Bengal Bay Crater (BBC)
R1
R2
R3
R4

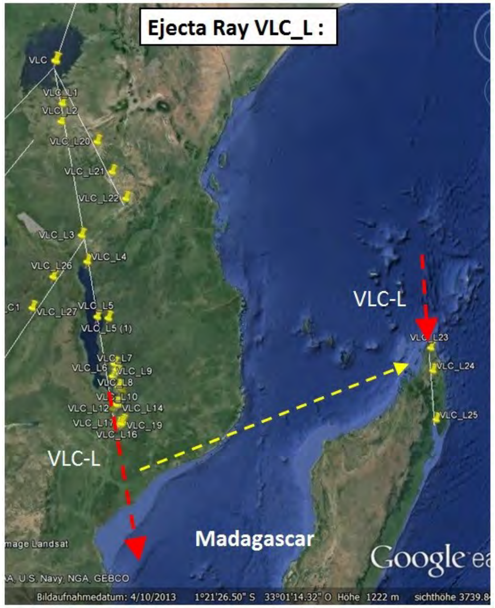
In the oil-exploration industry it is common knowledge that large oil-fields can be expected in an area effected by a big impact crater. Because a large impact not only produces the required structural traps (by impact induced fracturing and brecciation of the rock under the crater, which results in very effective porosity & permeability of the fractured rock), but also the palaeo-environment for the deposition of post-impact shales that provides the oil & gas.

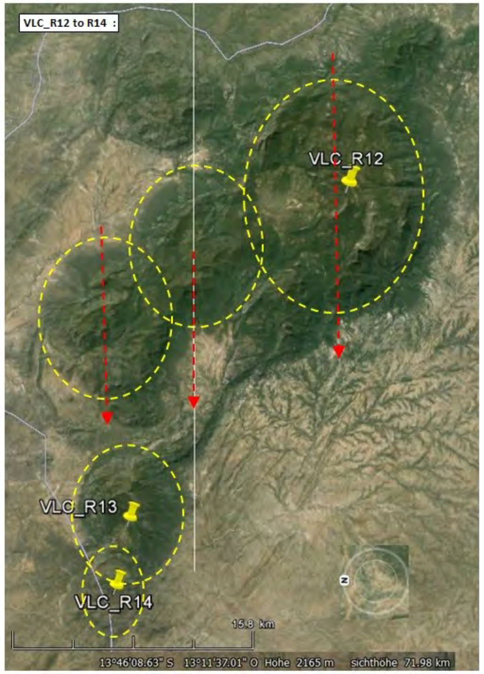
There are geological examples available, like the Ames Crater (Ø 14 km) in Oklahoma / USA, or the worldclass Cantarell Oil-field, which is located near the Ø 180 km Chicxulub Crater in Mexico, which clearly indicate the close connection of impact craters & oil- & gas-fields

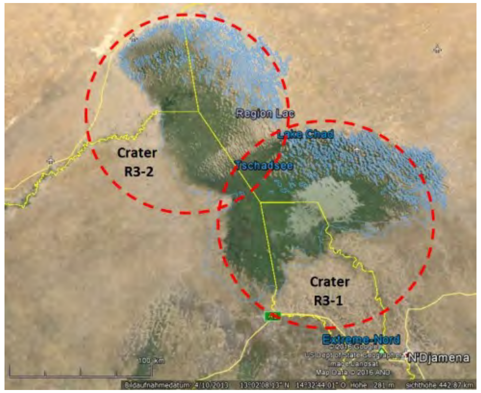
4a-1 Interesting (secondary)

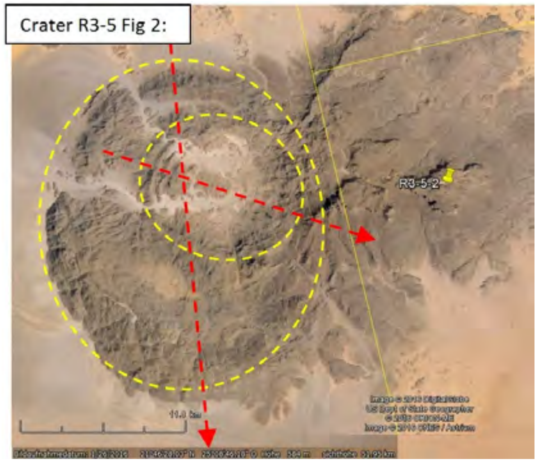
PTI-Impact Structures in Africa

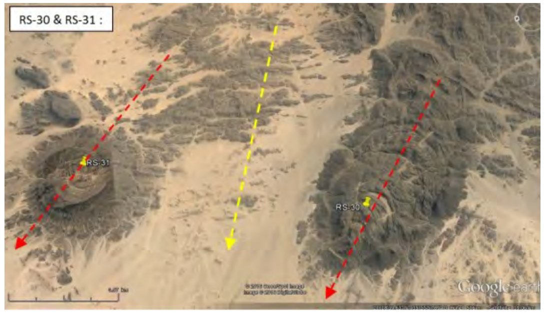
There are many large-scale structures visible, e.g. perfect elliptical & double-elliptical structures, linear-structures, structures which have a drop-like shape, crater-wall structures, fan-like structures, structures which have a shutter-cone-like appearance, and many volcanic structures which clearly were formed by high dynamical events (→ they probably represent ejecta (molten material) from the PTI, or from secondary craters caused by the PTI).


Ejecta Ray VLC_L :


VLC_R12 to R14 :
VLC_R12
VLC_R13
VLC_R14
15.8 km
13°46'08.63" S 33°11'37.01" O Höhe 2165 m sichthöhe 71.98 km

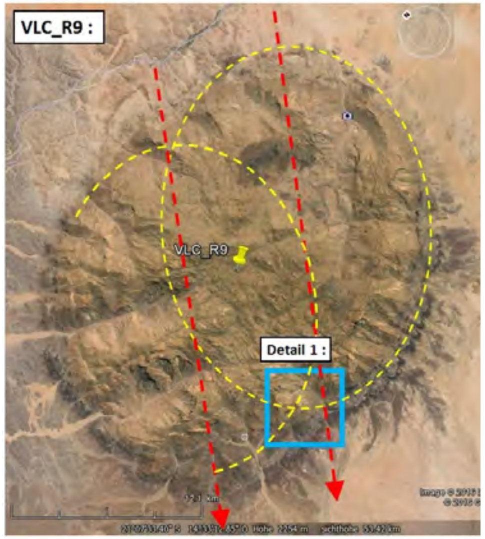


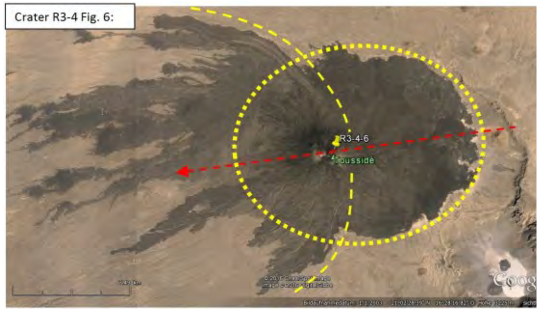

Crater R3-5 Fig 2:

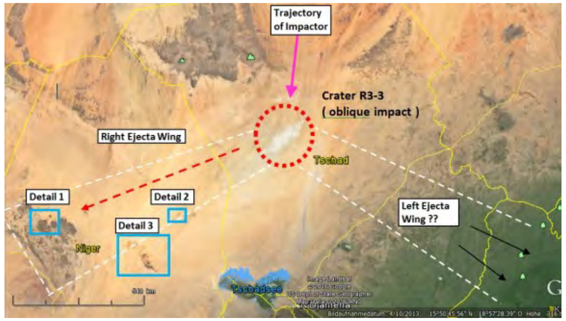

RS-30 & RS-31 :

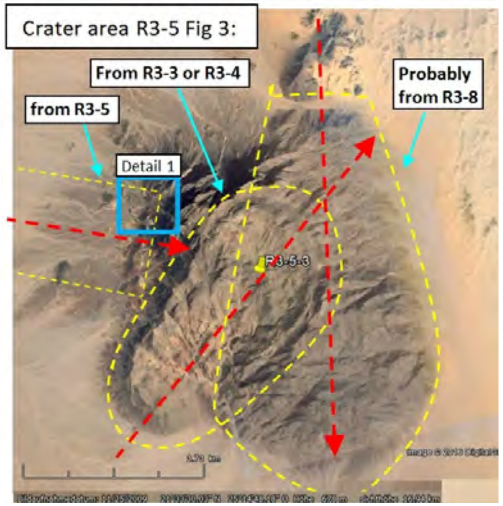
Here we probably see a relatively good conserved remain of the crater wall of the Impact Crater C2 !

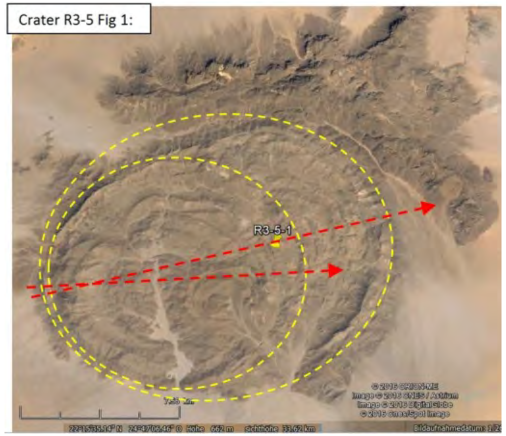
R3-X5 Detail 2 :

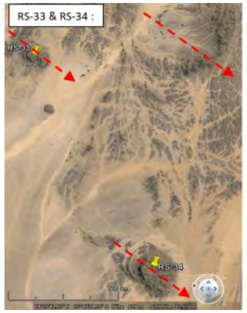

VLC_R9 :

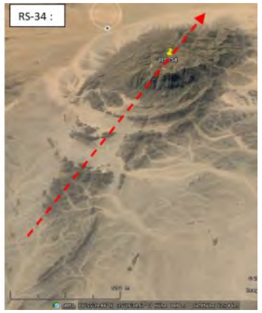

Crater R3-4 Fig. 6:




Crater area R3-5 Fig 3:


Crater R3-5 Fig 1:


RS-33 & RS-34 :


RS-34 :